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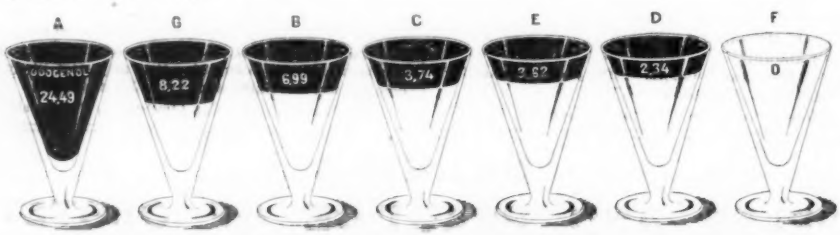

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A Record OF GUNSHOT WOUNDS OF THE KNEE-JOINT:

TREATMENT IN A BASE HOSPITAL.

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With a Note by Surgeon-General Sir GEORGE H. MAKINS, A.M.S., *President of the Royal College of Surgeons of England.*

GUNSHOT wounds of the knee-joint have furnished one of the most difficult and important surgical problems of the present campaign, and their treatment after nearly two and a half years of war appears to be far from satisfactory. Although, on the one hand, many cases progress favourably through the wound being clean and the joint but slightly infected, yet, on the other hand, many end either in amputation or in death of the patient from gross infection of the joint cavity. These latter results are particularly common in shell wounds and where the bone is fractured—indeed, the treatment of the severe cases has, on the whole, been universally admitted to be far from satisfactory.

Our experience in connexion with these wounds covers a period of about two years' work in a base hospital in France, and now comprises some hundreds of cases. In the earlier part of this period the results were most depressing, but as our experience increased the results improved. Indeed, the successful treatment of nearly all types of cases, especially the severe ones, that have come under our care during the past six months seems to merit some attention, and may possibly indicate a line of treatment that might, with success, be adopted in a large number of cases which have hitherto required amputation. The detailed recording of this latter series was suggested by Surgeon-General Sir George Makins, Consulting Surgeon to the British Forces in France, who has seen many of the cases at various times, and to whom we are greatly indebted for his invaluable help and advice in some of the more serious ones.

Surgical Anatomy.

Developmentally the knee-joint is formed of three main parts, one anterior and two lateral—the marks of this primary subdivision remaining in the reflexion of the synovial membrane over the crucial ligaments and in the ligamentum mucosum. This subdivision of the joint cavity is important, as infection may be limited under suitable conditions, as we shall see later on, to only one or two subdivisions. The subcrural pouch and the posterior bursa that communicate with the joint only unite with it quite late in development, the former at the age of three years, the latter about puberty, but frequently much later. Quite an appreciable percentage of these posterior bursæ, especially that of the semi-membranosus, never unite at all with the general synovial cavity.

The structure of the joint is such that, when once severely infected over its whole extent, drainage becomes a serious and difficult and, as usually adopted, most unsatisfactory procedure. The joint cavity offers such a large surface for septic absorption that to save life amputation must be clearly resorted to unless the area of the absorptive surface is quickly and permanently diminished, the infection rapidly overcome, and the quantity of discharge considerably lessened, so as not to be too great a strain on the patient's strength. This is more especially the case when the femur and tibia are fractured either singly or together.

Another fruitful cause of failure in these cases is the readiness and frequency with which the infective process in the joint breaks through the capsule and tracks along the fascial planes unless the tension is early relieved. This tracking usually takes place along certain well-defined lines; anteriorly, more usually on the inner side and in front of the internal intermuscular septum, and so along the line of the femoral vessels, even into Scarpa's triangle, less commonly on the outer side in front of the external intermuscular septum; posteriorly, by way of the popliteus and semi-membranosus bursæ into the popliteal space, and so along the back of the thigh amongst the hamstrings or along the calf in the fascial plane that separates the deep from the superficial layer of muscles, following the line of the posterior tibial vessels. When once the infection has reached these posterior fascial planes it may track upwards to the pelvis or downwards to the heel, or in both directions. Anteriorly, however, it never tracks downwards owing to the attachment of the fascia lata to the margins of the tuberosity of the tibia. Whether the infection tracks upwards or downwards on the posterior aspect of the limb depends almost entirely on posture; thus, if the foot is raised it tracks upwards, if the foot is lowered it tracks downwards.

Physiology.

The synovial membrane lining the joint, like other serous membranes, has an enormous capacity for combating sepsis, and, under suitable conditions, for forming adhesions—thereby tending to localise any inflammatory process that may be present. Indeed, we ourselves have often seen cases in which firm adhesions of apposed synovial surfaces have appeared at the end of 24 hours and have thereby localised the spread of infection to certain small areas of the joint cavity. Whenever the synovial membrane is injured effusion takes place into the joint, varying in type with the cause. This has one good result—namely, that it dilutes the concentration of the infection and lowers its virulence for a time; but it has one very serious disadvantage: it separates the synovial surfaces and thereby prevents the formation of adhesions which might otherwise have formed, and so localised the infection. This capacity for forming adhesions readily explains the greater seriousness of an infection of the joint when the entrance and exit wounds are small, than when they are fairly large, and allow of free escape of the synovial fluid.

Articular cartilage depends for its existence upon lymph; anything, therefore, which interferes with its normal supply will assist in causing its death. The cartilage is moderately resistant to infection and does not readily undergo erosion in the presence of sepsis if it is not at the same time the subject of pressure—indeed, we have seen it exist with a perfectly normal appearance for weeks under such circumstances. On the other hand, if the cartilage is the subject of pressure it rapidly undergoes erosion at the site of pressure. This is most important in the treatment, and shows the great necessity for maintaining constant extension of the limb during treatment so as to minimise the pressure of opposed bony surfaces on one another. If this is efficiently maintained erosion of the cartilage can largely be prevented.

From the above facts, then, we are forced to the conclusion that the lines along which all treatment must be directed in septic cases are:—

1. The lowering of intra-articular tension by evacuation of the exudate, thereby preventing the tracking of infection along the fascial planes.
2. The rapid overcoming of infection and the removal of infective material as soon as it is formed, thereby diminishing suppuration.
3. The promotion of the formation of adhesions, thereby limiting the area of infection and diminishing the area of the surface for toxic absorption.
4. The removal of pressure from the articular cartilage, thereby diminishing the chances of its becoming eroded.

All of these four ends appear to have been more or less satisfactorily attained in our last series of cases during the past six months, since the results obtained are so much more satisfactory than in those previously treated; indeed, if we exclude one case in which the leg was amputated for gangrene due to concomitant laceration of the popliteal vessels, and two that died, the one suffering on admission from septicæmia and the other from intense and fatal anæmia as the result of blood lost at the time of injury, we have had out of 60 cases 59 recoveries, and only one amputation. We will describe in detail, later on, the methods of treatment employed.

Types of Cases Met with.

Various types of gunshot wounds are met with and from the practical point of view are best classified as follows:—

1. *Simple perforation* with small entrance and exit wounds, almost invariably due to a rifle or machine-gun bullet.
2. *Penetrations* (*a*) *without retention* of the foreign body; (*b*) *with retention* of the foreign body.
3. *Perforations with large entrance and exit wounds.*
4. *Fractures secondarily involving the joint.*

These are almost invariably accompanied by the presence of varying degrees of bone injury and sepsis.

Bone injury.—The amount of bone injury can always be accurately estimated by efficient X ray examination—plates being taken in two planes at right angles to one another. It varies from case to case: showing in some mere drilling of the cancellous bone, in others slight chipping of one or other

bone, in still others severe fracture involving large masses of bone, and finally in some cases comminution of varying extent.

The risk attendant on bone injury varies with: 1. The amount of damage to the bone: thus in simple drilling or slight fracture there is often but little risk; but severe comminution costs the patient either his life or his limb. 2. The bone affected: thus injuries to the patella, even when severe, usually progress favourably; those to the femur are considerably more serious; those to the tibia most serious of all. The marked risk in the case of the tibia is due to its further removal from the centre of the circulation and to the proximity of its medullary cavity to the joint, more readily allowing of an osteo-myelitis to arise.

Infection.—In 54 consecutive cases we can give the following results as regards the presence of sepsis:—Sterile, 7; infected, 24; not investigated, 23. The organisms found to be present were streptococcus, staphylococcus, *Bacillus perfringens*, *B. tetani*. The streptococcus is probably the most important.

Infection occurs in varying degrees of severity; from the mildest type that readily settles down to that of fulminating arthritis, and every degree between these two may be met with. In a large number of the cases that died or required amputation we have found extensive osteo-myelitis of the femur or tibia, or of both bones.

Estimation of the degree of infection.—The degree of sepsis is clinically best estimated not by the temperature but by the pulse-rate and general appearance of the patient. In this way the cases closely resemble those of hæmothorax, and we have seen many which have run a high temperature for several days and then settled down, and which on exploration have yielded no signs of infection after the most careful bacteriological examination (Case 47). A high pulse-rate, more especially when associated with a slowly increasing or continuous temperature and dry tongue, is a serious sign (Case 9); but even in these cases it is well to proceed to a bacteriological examination; for occasionally in such cases we have found large numbers of pus cells in the exudate but have been unable to cultivate any organisms, and the cases have completely settled down on being left severely alone (Case 52). That organisms, even streptococci, are found in the exudate does not by any means afford sufficient grounds for draining or even in any way interfering with the joint. Large numbers of these cases completely settle down if kept at absolute rest, and efficiently extended, granted that the advent of sepsis from without is prevented.

Treatment.

History.—Earlier on we adopted various methods of treatment, but unfortunately the results were very disappointing. The improvement in the later results can be ascribed to the following causes: Firstly, to the greater care taken to secure adequate rest and fixation; secondly, to the treatment of the wound locally by Carrel's method; and, thirdly, in the cases of severe septic arthritis, to the method of drainage employed, together with the use of Carrel's method of wound treatment.

The cases that became severely septic we formerly drained in various ways: 1. By lateral or anterior incisions combined with posterior and counter incisions. 2. By turning upwards, in front, a U-shaped flap, including the patella. 3. By lateral or anterior incisions only, along the line of the synovial reflexion.

Drainage by lateral or anterior incisions only.—This method we found to be very unsatisfactory owing to the posterior part of the joint cavity forming a well in which pus accumulated, with the result that the patient emaciated rapidly from toxic absorption. Besides, the infection sooner or later broke through the capsule by way of the posterior synovial pouches and so found its way into the popliteal space. But in some cases after this method had been tried for some time and the patient had been going rapidly downhill, but before the sepsis had broken into the popliteal space, we instituted posterior drainage, with the result that the patient's general condition frequently considerably improved (e.g., Case No. 8).

In some few cases, however, where the sepsis was entirely limited to the anterior part of the joint, this method was successful, perhaps, in some instances, because the posterior bursæ had failed to unite during development with the general joint cavity.

Drainage by turning up a U shaped flap, including the patella.—The objection, as described above, applies equally to this method, but there was also one additional difficulty: the anterior wound remained open for a long time and, by its size, tended to increase the amount of suppuration. Considerable sloughing of the ligamentum patellæ also occurred.

Drainage by lateral and posterior incisions.—We always favoured this method of drainage more than the preceding two. But we found that, to be effective, the anterior incisions should never be made close to the margins of the patella, in a sagittal plane, but rather far outwards and backwards, so that the knife entered the joint in a coronal plane along the line of the synovial reflexion, and that the incisions should extend the entire length of the sub-crural pouch and be continued backwards and downwards along the synovial reflexion to the level of the lateral ligaments. (See Fig. A.)

The posterior incisions were made in the following way: A small pair of Spencer Wells's artery forceps were passed backwards under cover of the lateral ligament and thrust forcibly towards the popliteal space. The point of the forceps then lay against the head of the gastrocnemius, close to the popliteal vessels, and near the skin surface. By this route the forceps passed through the posterior synovial prolongations. A vertical incision 2½ inches long was then made on to the forceps, its edges retracted, and the capsule of the joint opened posteriorly, opposite the interval between the bones, by a transverse incision, directed outwards from the middle line of the limb. The heads of the gastrocnemius were treated in the same way but not completely divided. By this means there was made a perfectly free and fairly wide track leading from the surface to the back of the joint and allowing of free drainage. (See Figs. A and B.)

FIG. A.

Site of lateral incisions for drainage of knee-joint.

FIG. B.

Site of posterior incisions for drainage of knee-joint.

Of the three methods this last undoubtedly secured the best drainage of the joint.

It was our custom at one time to use large rubber drainage-tubes.

These tubes were placed in the joint as follows: Two from side to side, one in the upper part of the sub-crural pouch, the other low down under the patella and ligamentum patellæ, and one on either side, passing backwards under cover of the lateral ligament and through the popliteal space into the posterior incision. The two anterior tubes were removed about the fourth day and the two lateral ones about the eighth, sometimes sooner. We regularly washed out the joint cavity once or twice daily with a mixture of iodine and peroxide, or peroxide and eusol, or hypertonic saline.

But the results were not so satisfactory as we would have wished; the joint cavity only very slowly became obliterated and the prolonged and severe suppuration, and consequent toxic absorption that occurred, rapidly emaciated the patient, so that to save life amputation had to be resorted to in an appreciable number of the cases. In cases where there was any severe fracture of tibia or femur we had invariably to amputate the limb.

Looking back on these cases, we have been forced to the conclusion that the failures were due to:—

1. The rubber drainage-tubes maintaining the sepsis.
2. The washing out of the joint preventing the obliteration of the synovial cavity, thereby allowing of the absorption of toxic products from an extensive surface.
3. The prolonged formation of not inconsiderable quantities of pus exhausting the patient.
4. Imperfect fixation of the joint, preventing the formation of adhesions and causing increased toxic absorption.

In our present series of cases all these disadvantages have been largely overcome with, in consequence, marked improvement in the results.

Principles of Treatment.

Our present methods of treatment in severe cases are based on three fundamentals: 1. Absolute rest and fixation. 2. The strictest asepsis. 3. The use of Carrel's method of wound treatment.

Absolute rest and fixation of the joint.—We secure these at once, whatever the hour, the patient enters the hospital. We do so in the following way: The fully extended limb is placed in an *efficiently made* Thomas's knee-splint and extended by the *fixed* method, using for this purpose stout calico bandage glued to the leg and tied round the end of the splint. The limb is supported in the splint by two sheets of perforated zinc 4 × 6 inches bent lengthways to accommodate the transverse curve of the part. These sheets are supported in turn by bands of aluminium strapping bent over each side of the splint. One of these sheets of zinc is laid under the thigh, the other under the calf; their position and the amount of weight that each bears can easily be regulated by bending the metal strapping at a suitable place. These

supports, once applied, are never removed if it can possibly be avoided—not even for operative procedures. In this way rigid support is given to the limb and absolute rest and fixation are secured.

To prevent too much local pressure on the muscles by the metal supports the remaining surface of the limb is supported by bands of stout flannel bandage, pinned round the splint. These flannel bands can easily be removed and reapplied with each dressing as far as is necessary. They also help to keep the dressings in place. There is no doubt, in our minds, as to the superiority of fixed over mobile extension—granted that the extension is attended to daily and tightened up as required by the stretching of the skin. If the extension becomes inefficient, "night starts" make their appearance, but can be easily controlled by readjusting the extension. Unless the flannel bands under the knee are kept sufficiently taut, and the metal supports slightly raised as the muscles atrophy from pressure, there may be, and in some cases actually is, a tendency to the production of genu recurvatum.

Asepsis.—This must be efficiently carried out, not only at the time of operation but also at each subsequent dressing. With this end in view it has been our custom to have all cases of wounds involving the knee-joint sent, as far as possible, to one ward, and under the care of a single medical officer (one of ourselves, J. C.), and also to have all the dressings done by the same person on each occasion, in order to avoid any division of responsibility in the treatment of the individual cases.

The use of Carrel's method of wound treatment.—The marked improvement in results recently is very largely due to our adoption of this method of wound treatment. The tubes are used either uncovered or covered with cheap Turkish towelling. The perforated portions of the tubes are passed over the entire surface of the wound and in each recess of the wound, down to its very extremity, so that in the latter case all the perforations lie hidden in the recess.

The wound is then dressed as usual with gauze moistened in hypochlorite solution, and the open ends of the tubes left free outside the dressings. Two to three drachms of a 0·5 per cent. hypochlorite solution are squirted down each tube, day and night, at two-hourly intervals, with *perfect regularity.*

With this method of treatment efficiently carried out we find:—

1. That infection is most effectually counteracted.
2. That organisms and the pabulum suitable for their growth are washed outwards, even from the deepest parts of the wound.
3. That ingress of sepsis from without is prevented—to our minds a most important consideration in the treatment of knee-joint cases.
4. That pus only forms in small quantity.
5. That adhesions of the synovial membranes form with great readiness.
6. That the patient need only be dressed once in 24 or 48 hours.

In other words, this method of treatment fulfils all the requirements which we stated above were so necessary to the successful treatment of infected cases.

Methods of Treatment Employed.

1. *Absolute rest and fixation*, secured as above described, were made use of in every case, and were all that was necessary in (*a*) cases of clean perforations, (*b*) cases of very mild sepsis.

2. *Aspiration* was never used as a routine practice, save for the purpose of making a bacteriological examination of the joint fluid. We think that the damage done to the joint and its synovial membranes by this procedure in mildly septic cases more than compensates for the advantages gained. Hence we never resorted to repeated aspiration, save in one case in which there was a shrapnel ball embedded in the external condyle of the femur, and which from general principles were thought to be septic; after each aspiration there was accumulation of effusion in the joint under very high tension; in such a case we considered that the risk of infection was so great that we ought to be acquainted with the changes going on inside the joint. After aspiration the tightest bandage possible was used compatible with safety.

3. *Exploration and washing out of the joint cavity, followed by suture of the wound.*—This we used only in cases showing moderate degrees of sepsis, not localised by adhesions and not progressing favourably. After the application of a tourniquet the joint was explored in the usual situation, the cavity washed out with a mixture of eusol and hydrogen peroxide, and every particle of fibrin that could be seen was removed. The greatest care was always taken that a perfectly free exit was allowed to the fluid for fear lest the recesses at the back and closed off parts of the joint be opened up and sepsis be driven into them.

The wound was sutured in layers with 10-day chromic catgut; the synovial membrane by a continuous suture; the capsule, muscle, and deep and superficial fasciæ in separate layers by interrupted sutures. The skin edges were united by interrupted silkworm gut sutures. Finally the limb was *very* firmly bandaged.

Several of these cases had to be fully drained later on.

We think this method has only a very limited application.

4. *The local application of Carrel's tubes to the wound surface* was invariably used in cases in which a wound of any size led into the joint cavity. When the wound appeared fairly clean and was more than 36 hours old, no operative procedure was ever adopted. The entire wound surface was covered by the tubes.

5. *Excision of the wound locally*, down to and including the capsule, but without interferring in any way with the synovial membrane, was used in those cases in which the wound was recent (under 48 hours old) and septic—particularly when it was very septic in its superficial part, and hence there was a considerable risk of the spread of sepsis into the interior of the joint. After excision the wound was left widely open and covered by Carrel's tubes.

If it was thought necessary in these cases to explore the joint, it was done through a separate incision and the procedure treated as though it were an entirely new operation.

6. *Local insertion of Carrel's tubes into the joint through the original wound* was fairly frequently resorted to. It was never done shortly after the infliction of the wound, but only after method No. 4 had failed and it was found that definitely infected fluid was exuding from the joint and it appeared probable that the sepsis was localised to only one part of the joint cavity. Even in more generalised infections, when of moderate severity, this method was of use. It was found particularly satisfactory in those cases in which there was severe fracture of the patella and in which not infrequently severe sepsis developed in the anterior part of the joint cavity.

The number of tubes inserted locally varied, but was never more than three. They were passed into that part of the joint that was infected; the lines they were to occupy were those along which the greatest quantity of infected material could be evacuated by very gentle pressure. The tubes were changed either daily or once every two days. When the general joint cavity was locked off and there remained a narrow track along the line occupied by the tube, this last was removed. In some cases, usually only when the tubes had had to remain in the joint for a number of days, counter opening at the extremity of the sinus was necessary to secure rapid healing.

7. *Drainage of the joint by free incisions and the insertions of Carrel's tubes:*—

(*a*) *In cases of complete comminution of the patella* with a large entrance wound over the same. When the case was received early—i.e., within 24 hours of injury—immediate operation was performed because of the risk of infection from without. A U-shaped flap, including the patella, was turned upwards and the fragmented patella and the skin wound excised *en masse*. The joint cavity was carefully washed out, as completely as possible, and the lower part of the flap sutured back in place with stout silkworm gut. Three or four covered Carrel's tubes were inserted from side to side, and replaced by uncovered ones after two days. These, in turn, were completely removed on the fourth day and the incision completely closed. In these cases, if the posterior part of the joint is severely infected, posterior drainage may have to be used at once or later on.

(*b*) *In cases of severe and diffuse arthritis* the joint was fully drained by lateral and posterior incisions in the manner described above. The joint cavity was washed out very carefully indeed, and all flakes of lymph removed, as far as possible. Covered Carrel's tubes were then inserted as follows: Anteriorly, four from side to side, one at the uppermost extremity of the sub-crural pouch, one under the ligamentum patellæ and two others intermediate in position; laterally one under cover of each lateral ligament passing backwards through the posterior synovial pouches into the posterior wounds. Other covered tubes were laid on the surfaces of all the incisions. As a general rule, no dressing was done till the second day, when the covered tubes were carefully removed under gas and replaced by uncovered ones *occupying the same tracks.* On the fourth day the anterior ones were removed altogether and the lateral ones changed, these being retained till the sixth or eighth day.

No washing out of the joint was attempted—we merely syringed the surface of the wounds, using perhaps a little *very gentle* lavage for the tracks, taking the utmost care not to break down any adhesions. All flakes of lymph were most carefully removed.

The dressing was usually changed only every second day, and uncovered tubes were laid along the incisions.

In this way the entire joint cavity readily became obliterated completely after about a fortnight or three weeks.

(*c*) *In cases of severe and diffuse arthritis accompanied by fracture* the same method of treatment was adopted as in

TABULAR STATEMENT OF 60 CASES TREATED BY THE CARREL-DAKIN METHOD.

Very Severe (Nos. 1–14), 14; Severe (Nos. 15–31), 17; Slight (Nos. 32–44), 13; Retained Foreign Body (Nos. 45–60), 16.

No.	Missile.	Injury.	Organism.	Treatment.		Complications.	Condition on discharge.	Ultimate result.
				In C.C.S.	In base hospital.			
1	Shell.	R. leg: Entrance wound in popliteal space. F.B. lodged in intercondyloid space of femur. Extensive popliteal cellulitis and secondary invasion of knee-joint. (Practically moribund.)	Streptococci.	Free incisions in popliteal space and back of calf.	Joint drained laterally and posteriorly. Carrel's tubes inserted.	Severe cellulitis in calf and back of thigh requiring incision. (See No. 2, same patient.)	Almost completely healed. Sinus at back of knee.	Firm bony ankylosis. Can walk fairly well.
2	,,	L. leg: Entrance in popliteal space. F.B. lodged in condyle of femur. Extensive popliteal cellulitis.	,,	,,	,,	Suppuration in calf requiring incision. (See No. 1.)	Incisions almost completely healed. Sinus at back of knee.	Firm bony ankylosis. Can walk fairly readily.
3	,,	Through-and-through wound. Exit about 2½ in. in diameter. Extensive fracture of int. epicondyle and adjacent part of shaft of femur.	Streptococci and staphylococci and anaerobes.	—	Wounds excised. Larger portion of condyle (that was loose) removed. Knee drained laterally and posteriorly. Carrel's tubes.	In fifth week developed local tetanus in limb. Became general. Had severe symptoms of anaphylaxis. Cured by antitetanic serum (90,000 units).	Healed save for sinus leading down to site of fracture. Firm union—bony.	Excellent and useful leg. Ankylosis. (Fig. 1.)
4	,,	Very foul and extensive flesh wound of front of thigh, carrying away most of quadriceps tendon and opening suprapatellar pouch. Joint full of foul pus.	Streptococci, gas organisms.	—	Wound excised, joint drained laterally only. Did no good, and so 5 days later posterior drainage instituted, began to make progress at once.	Some suppuration in calf and popliteal space requiring incisions.	Almost completely healed.	Firm bony union. Perfectly useful limb.
5	,,	Through-and-through wound of joint. Fracture of ext. condyle of femur and adjacent part of tibia (slight).	Streptococci.	Wound excised and packed.	—	G.S.W. right arm, with severe fracture of humerus. Septicæmia.	—	Death.
6	Rifle bullet.	Fractured tibia, secondarily involving joint.	,,	—	—	Severe anæmia from blood loss before admission, with resulting death.	—	,,
7	Shell.	Fracture of ext. epicondyle of femur. Severe cellulitis of calf.	*Staphylococcus aureus.*	Wound excised freely in C.C.S., leaving yawning gap into knee-joint.	Joint drained laterally and posteriorly. Calf opened freely.	Cellulitis of calf spread very rapidly and extensively, necessitating amputation.	—	Amputation.
8	,,	Wound involving knee-joint in front. F.B. lodged on inner side of joint. Slight fracture of int. condyle.	Streptococci, staphylococci, anaerobes.	Wound excised and joint laid freely open by a semilunar incision below patella over an extent of 4 in. by 1½ in.	On admission wound very foul indeed and very sloughy. Carrel's tubes applied to same. Pt. went slowly downhill. Joint then drained posteriorly and pt. began to improve at once.	R. leg amputated in C.C.S. for gas gangrene in foot and leg. Other flesh wounds. Developed calf abscess behind knee. Required incision.	Joint completely healed. Incision for calf abscess rapidly closing. Firm union? bony.	Firm bony ankylosis.
9	,,	Severe fracture of tibia involving knee joint, with septic arthritis.	*Staphylococcus aureus* and *B. perfringens.*	Wounds excised and sutured up.	On admission wound severely septic, with a good deal of necrosis of tibia and acute septic arthritis. Joint drained laterally and posteriorly.	—	Completely healed save for small sinus leading down to small necrotic mass of tibia. About 15° of movement in the joint.	,, ,,
10	Rifle bullet.	Through-and-through wound. Severe fracture of shaft of femur 2 in. above condyles and involving joint.	?	Wound excised. Tubes from side to side through site of fracture. Joint not explored.	Tubes removed at once and replaced by Carrel's tubes.	—	Knee not affected, rapidly healing. Quite clean.	?
11	Machine-gun bullet.	Through-and-through wound, completely shattering patella. Wounds ¼ in. in diameter.	Cocci. ? nature.	—	U-shaped flap containing patella turned upwards. Pulverised patella excised. Flap sutured down in middle. Carrel's tubes inserted from side to side.	—	Completely healed. Very poor movement.	Firm bony ankylosis.
12	Rifle bullet.	Through-and-through wound. Patella pulverised; ext. condyle of femur fractured. Part of bullet-casing retained in joint.	Numerous cocci. ? nature.	—	U-shaped flap including patella turned upwards. Pulverised patella excised. Flap replaced and sutured down in the middle. Carrel's tubes from side to side.	—	Almost completely healed.	Firm fibrous ankylosis. Excellent limb.
13	,,	Severe fracture of femur just above condyles and involving knee-joint; F.B. retained on inner side of thigh.	—	Wound excised. Incision on inner side of thigh at site of fracture. Loose bone removed.	Absolute rest and fixation. Carrel's tubes inserted into wounds.	—	Almost healed.	Almost healed. (See Fig. 2.)
14	Shell.	Transverse fracture of femur	?	Entrance wound excised;	Packs removed. Replaced by	Furious secondary hæmor-	—	Death.

14	Shell.	Transverse fracture of femur just above condyles involving sub-crural pouch.	?	Entrance wound excised; F.B. removed from thigh by separate incision on opposite side and fracture explored.	Packs removed. Replaced by Carrel's tubes.	Furious secondary hæmorrhage from popliteal artery, due to bone fragment pressing on artery in early stages.	—	Death.
15	,,	Entrance in popliteal space. F.B. lodged in intercondyloid space of femur outside capsule. Secondary septic infection of joint. No fracture.	Streptococci.	—	F.B. removed through popliteal space. Joint cavity explored and washed out with eusol and peroxide. Sewn up.	Numerous other severe and septic flesh wounds.	Healed. Good movement.	Movement excellent and improving.
16	,,	Glancing wound over patella. Transverse fracture of patella with separation of fragments by ¼ in. Considerable sloughing of extensor tendon fibres over patella.	Staphylococci.	—	Carrel's tubes laid locally on wound and between fragments of bone. Later wound opened up because of suppuration in joint, and two Carrel's tubes inserted into joint, one going down to each lateral ligament.	—	Quite healed. Some movement.	Slight movement.
17	Machine-gun bullet.	Pin-point entrance over patella; exit ½ in. in diameter over ext. condyle of femur. Transverse fracture of patella with pulverisation of middle third. Moderately severe fracture of ext. condyle.	Streptococci.	Joint aspirated and injected with formalin and glycerine.	Carrel's tubes locally to wound. Later on exit wound opened up for suppuration, but bone left untouched; anterior wound enlarged transversely and pulverised bone removed, and 3 Carrel's tubes inserted into joint, one upwards into sub-crural pouch and one laterally on either side towards each lateral ligament.	Some tracking and suppuration on outer side of thigh.	Healed.	Slight movement, increasing (See Fig. 3.)
18	Shell.	Through-and-through wound passing under patella. Slight fracture of trochlear surface of femur.	?	Wounds excised and fragments of femur pushed into position. Rubber tube inserted into joint from side to side under patella. Joint cavity packed.	Tube and pack removed at once. Carrel's tubes laid along track from both ends.	—	Healed. Some movement.	?
19	,,	F.B. lodged near joint. Secondary septic arthritis.	?	—	Carrel's tubes applied to wound surface. Later required free incisions in thigh, for severe tracking.	Considerable tracking in front of thigh.	Wounds rapidly healing. Practically no movement.	?
20	,,	Entrance only. Patella split longitudinally. Fragments of bone driven into joint cavity.	Anaerobes.	F.B. removed from between fragments of patella.	Clothing removed from interior of joint. Carrel's tubes applied to surface of wound and inserted between bone fragments just inside the joint.	Frac. skull; several severe flesh wounds.	Practically healed. Patella movable on femur.	Free movement.
21	,,	L. knee: Sloughing flesh wound. Sloughed into joint.	Streptococci.	—	Insertion of Carrel's tubes through wound into joint.	See No. 45 (same patient). 1. G.S.W. head with septic depressed fracture requiring trephining. 2. G.S.W. R. ankle-joint with fracture of astragalus and internal malleolus and septic arthritis. 3. Frac. of 1st metatarsal and severe plantar suppuration. 4. Other severe flesh wounds.	Healed. Slight movement.	Slight movement.
22	Rifle bullet.	Through-and-through wound. Exit anteriorly large and septic. Synovial fluid (bloody) escaping from wound.	?	Anterior wound excised.	Carrel's tubes applied to surface of excised wound.	—	Wound almost healed. Had movement on discharge.	Some movement. Improving.
23	,,	Through-and-through wound. Exit ¾ in. in diameter through ligamentum patellæ, which was sloughing freely. Frac. of spine and external tuberosity of tibia.	?	—	Carrel's tubes applied locally to wound.	—	Practically healed. Some movement.	Fair movement.
24	Machine-gun bullet.	Through-and-through wound. Severe stellate frac. of patella.	Sterile.	Wounds opened up. Joint drained from side to side by rubber tube.	Tubes removed at once—i.e., 3 days later replaced by Carrel's tubes.	—	Clean granulating wounds almost healed.	Slight movement. Increasing under massage.
25	Shell.	Through-and-through wound ½ in. in diameter. Fracture of ext. epicondyle of femur.	?	—	F.B. removed from thigh. Carrel's tubes applied locally to wound.	Cellulitis of thigh and calf in region of F.B.	Granulating wounds nearly healed.	Good movement.
26	,,	Through-and-through wound. F.B. *in situ* on outer side of femur. Severe stellate fracture of patella.	?	Extensive removal of skin from front of knee and adjacent part of leg.	Bismuth and iodoform paste (Morison's paste) to raw surface.	Severe flesh wounds elsewhere.	Clean granulating and rapidly healing wound.	Fair movement, increasing.

TABULAR STATEMENT OF 60 CASES TREATED BY THE CARREL-DAKIN METHOD—(*Continued*).

No.	Missile.	Injury.	Organism.	Treatment.		Complications.	Condition on discharge.	Ultimate result.
				In C.C.S.	In base hospital.			
27	Bomb fragment.	Through-and-through wound. Slight frac. of ext. epicondyle of femur. Laceration of popliteal vessels.	—	—	Amputation through thigh. Joint not infected.	Gangrene of leg.	—	Amputation.
28	Shell.	Entrance only slight frac. of patella. Severe cellulitis round entrance wound.	?	—	Wound opened up freely. (F.B. did not penetrate joint.)	—	Almost healed.	Movement good and free.
29	,,	Through-and-through wound. F.B. lodged in thigh. Stellate frac. of patella and slight frac. of ext. epicondyle of femur.	?	—	Rest and fixation. F.B.'s elsewhere removed.	Several other severe flesh wounds.	Healed. Some movement.	Almost perfect movement.
30	,,	Through-and-through wound. Slight fracture of external lip of trochlear surface of femur.	?	Exit wound excised and sutured.	Sutures all removed at once because of severe sepsis in wound. Carrel's tubes applied to wound.	—	Healed. Quite good movement.	Good movement.
31	Rifle bullet.	L. knee: Through-and-through wound. Small entrance and exit. Comminuted frac. of patella.	?	—	Carrel's tubes over wounds. Later wound over patella had to be enlarged because of sepsis in joint, and Carrel's tubes inserted into joint locally.	See No. 32 (same patient). G.S.W. R. knee-joint.	Practically healed.	Fair movement.
32	,,	R. knee: Simple through-and-through wound. Leech-bite entrance and exit. Perforation of patella.	?	—	Rest and fixation.	See No. 31.	Healed. Perfect movement.	Perfect movement.
33	,,	Through-and-through wound. Leech-bite entrance and exit. Slight fracture of femur (drilled).	?	—	,,	—	Healed. Good movement.	,, ,,
34	,,	Through-and-through wound. Wounds size of finger-tip. Femur drilled.	—	—	Wounds excised down to and including capsule for local sepsis.	—	Healed.	?
35	,,	Through-and-through wound. Femur drilled.	?	—	Rest and fixation.	—	Healed. Good movement.	Perfect movement.
36	Shrapnel ball.	Through-and-through wound. No bone injury by X ray. (Bloody synovial fluid escaping from wound.)	?	Ball removed from under skin.	Carrel's tubes applied to surface of wounds.	Severe flesh wound of thigh.	Healed. Some movement.	Movement poor, but improving.
37	Rifle bullet.	Through-and-through wound. Small entrance and exit. No bone injury by X ray.	?	—	Rest and fixation.	—	Healed.	Fair movement.
38	Shell.	Severe flesh wound involving joint.	?	Wound excised down to joint. Synovial membrane sutured. Joint drained by rubber tube.	Tube removed at once. Carrel's tubes into wound.	G.S.W. chest with pneumo-hæmothorax that became infected with streptococcus. Other flesh wounds.	Healed. Joint movable.	?
39	,,	Flesh wound involving joint.	?	Wound excised. Joint opened through separate incision, washed out, and closed. Septic wound of popliteal space drained by tubes.	Carrel's tubes to wound surface.	—	Clean granulating wounds.	Fair movement, increasing.
40	Rifle bullet.	Through-and-through wound. Pin-point entrance and exit. Femur drilled.	?	—	Rest and fixation.	—	Wounds healed. Can move the joint.	Almost complete range of movement.
41	,,	Through-and-through wound. Pin-point entrance and exit. Slight fracture of internal epicondyle of femur.	?	—	Incision in popliteal space for cellulitis.	Some cellulitis of popliteal space.	Quite healed.	Some movement. Rapidly improving.
42	,,	Through-and-through wound. Leech-bite entrance and exit. Internal condyle of femur drilled.	?	—	Rest and fixation.	—	Healed. Some movement.	Movement good and improving.
43	,,	,,	?	—	,,	—	Healed. Fair movement.	Perfect movement.
44	,,	Through-and-through wound. Leech-bite entrance and exit. Slight grooving of ext. tuberosity of tibia just below articular margin.	?	—	,,	—	Healed. Good movement.	?
45	Shell fragment	R. knee: Patella perforated. Severe gas infection round	?	—	Entrance wound freely opened	See No. 21	Wound clean and granulat	Slight movement

osity of tibia just below articular margin.

45	Shell fragment (small).	R. knee. Patella perforated. Severe gas infection round about entrance wound.	?	—	Entrance wound freely opened up. Rest and fixation. Joint cavity left alone.	See No. 21 (same patient).	Wound clean and granulating. F.B. in joint.	Slight movement.
46	Shell.	Small F.B. lodged behind and on inner side of ext. epicondyle of femur. Frac. of ext. epicondyle on inner aspect.	Sterile.		Wound incised. Joint explored. F.B. not found. Washed out with eusol and peroxide. Healed by first intention.	—	Healed. Movement not attempted. F.B. in joint.	?
47	Shrapnel ball.	Lodged in substance of ext. condyle of femur.	,,	—	Repeated aspiration for recurrent distension of joint cavity. F.B. left untouched.	Some popliteal cellulitis.	Healed. Practically no distension of joint cavity. F.B. *in situ*.	Fair movement, 15°, steadily increasing in extent.
48	,,	Ball lodged in internal condyle of femur.	?	—	Rest and fixation. F.B. left untouched.	—	Healed. F.B. *in situ*.	Very good movement.
49	Shell (small).	Several minute F.B.'s had passed through joint. One lodged in sub-crural pouch.	—	—	Rest and fixation.	—	Healed. Good movement. F.B. *in situ*.	?
50	,,	F.B. in joint in the inter-condyloid space. Slight fracture of external condyle of femur.	?	Entrance wound excised; joint explored; F.B. not found. Joint washed out with eusol; formalin and glycerine injected. Synovial membrane sutured. Rest of wound left open.	Left severely alone. Bismuth and iodoform paste (Morison's) applied to wound.	Numerous other severe wounds.	Wounds clean, granulating, and healing. Some movement.	?
51	Shell (very large).	Entrance through patella, which was completely shattered. F.B. lodged in inner aspect of ext. epicondyle, which was fractured.	Pure anaerobe; later on infected by streptococcus also.	—	U-flap turned up, including patella. Patella excised, F.B. removed, and joint washed out with eusol and peroxide. Carrel's tubes from side to side. Later became severely septic, when joint was excised.	After excision developed abscesses in upper part of calf and lower part of thigh.	Excised joint granulating freely. Very clean.	?
52	Shell.	Entrance about ¼ in. in diameter, very septic. F.B. lodged in inter-condyloid notch. Severe fracture of external epicondyle of femur.	Sterile.	—	Wound excised down to and including capsule; no loose bone fragments removed. Joint cavity then explored through separate incision. F.B. removed. Cavity washed out with eusol and peroxide. Carrel's tubes applied to surface of excised wounds.	Considerable sloughing in excised wound.	Incision healed by first intention. Excised wound clean and granulating. No enlargement of the joint.	Severely shaken during transit to England. Knee at once began to give trouble. Amputation 10 days after discharge.
53	,,	F.B. retained in joint. Slight fract. of internal condyle of femur.	A few diplococci. Sterile on cultivation.	—	Entrance wound excised. F.B. removed from joint through separate incision. Synovial cavity washed out with eusol and peroxide.	Severe flesh wounds of R. arm and L. leg.	Incision healed. Wounds clean and granulating.	Fit for service.
54	,,	Entrance wound ¼ in. in diameter. Severe frac. of int. condyle of femur and int. tuberosity of tibia. F.B. lodged between the two bones.	Sterile.	—	Wound excised down to and including capsule. F.B. removed through same. Joint cavity left severely alone.	—	Healed. Some movement.	Fair movement, increasing.
55	,,	F.B. lodged in joint cavity close to ligamentum patellæ.	,,	—	Wound excised. F.B. removed. Joint cavity not washed out. Incision left open. Bismuth and iodoform paste (Morison's) applied to open wound.	—	Wound almost healed.	A useful limb, but considerable restriction of flexion.
56	,,	F.B. retained in inner surface of internal condyle of femur. Loose bone in notch.	Isolated cocci. ? nature.	—	Entrance wound excised down to and including capsule. F.B. and loose bone removed from joint. Joint washed with eusol and peroxide. Synovial membrane sutured and wound closed. Small glass drainage-tube down to synovial membrane.	—	Healed, save for site of drainage-tube in incision.	Can flex the knee to a right angle.
57	,,	Entrance only. F.B. retained; femur fractured.	Streptococci.	F.B. removed. Tube inserted from side to side under patella.	Tube removed at once (i.e., 24 hours after operation) and replaced by Carrel's tubes.	—	Granulating surface only.	A little movement.
58	,,	Entrance only. F.B. retained in supra-patellar pouch. Femur indented.	Streptococci (in small numbers).	F.B. removed. Rubber drainage-tube into joint. Wound not sewn up.	Tube removed at once (i.e., 2 days later) and replaced by Carrel's tubes.	—	Clean, granulating incision almost healed.	Slight movement.
59	,,	Entrance only. No bone injury by X ray.	?	Wound excised. F.B. extracted from wall of joint. Packed.	Pack removed. Carrel's tubes applied to surface of wound.	Several severe flesh wounds elsewhere.	Healed. Some movement in joint.	?
60	,,	Large penetrating wound of joint. No fracture shown by X ray. Synovial fluid escaping from joint.	—	Wound opened up. F.B. removed from just inside the joint. Joint cavity washed out with eusol.	Carrel's tubes applied to wound surface. Later required free incisions in thigh for severe tracking.	Severe tracking upwards in front of thigh.	Almost healed. Some movement.	?

(*b*), but all loose and necrotic bone was most carefully removed, paying particular attention to the fractured surface left behind. Here the Carrel's tubes continued to be laid on the fractured surface till it had completely granulated.

8. *Excision of the joint.*—Our own experience recently has been limited to two cases.

In one case the right humerus was extensively fractured and very septic; and the right knee was severely septic, with the femur and tibia both slightly fractured. The knee-joint was excised, but the cut surface of the femur did not bleed very well, though the vessels were not thrombosed. The patient died a few hours later. Post mortem very severe osteo-myelitis of the humerus and early diffuse osteo-myelitis of the femur were found, with signs of septicæmia.

This was undoubtedly an entirely hopeless case and quite unfit for excision; amputation high up the thigh was the only remedy that might have proved of any value. Unfortunately at the time of operation there was nothing that suggested the presence of the bone disease beyond the local anæmia above mentioned.

In the second case, a large piece of shell casing had passed through the patella and lodged in a gouged-out depression on the inner aspect of the external condyle of the femur. Examination of the joint fluid showed a pure infection with *Bacillus perfringens*. In view of the nature of the infection and the complete pulverisation of the patella, a U-shaped flap, including the patella, was turned up, the patella excised, and the foreign body removed. The joint was washed out and treated as described under method 7 (*a*). Unfortunately not enough bone had been removed from the site of fracture in the femur, with the result that the joint cavity remained severely septic and formed a rather large amount of pus. We then excised the joint. The patient was later discharged to England, almost healed.

This case did not do so well as one would have expected had the joint been drained posteriorly after removal of all the necrotic bone. We used excision here because we were afraid that the cavity left after removal of the septic bone might give trouble owing to its inaccessible situation. In such a case in the future we would not resort to excision but to the method described under 7 (*b*), after removing all necrotic bone and leaving behind a healthy bleeding surface.

We will discuss later on the question of excision of the joint in septic cases.

9. *Amputation* was reserved for two types of cases:—

i. For cases of severe joint injury accompanied by injury to the popliteal vessels.

ii. For cases in which there was severe comminution of tibia or femur, or both bones.

iii. For cases in which there was extensive osteo-myelitis of tibia or femur. (This was usually suggested by the marked pain and tenderness along the entire length of the affected bone, with the very severe general condition of the patient.)

Owing to the risk of osteo-myelitis arising we consider that early operations in the way of efficient drainage both of the joint and the fracture should be resorted to, otherwise amputation or death is certain to result.

Foreign Bodies Lodged Inside the Knee-joint.

The treatment of these cases depends largely on: (1) The nature of the foreign body—whether rifle bullet, shrapnel ball, or shell fragment; (2) its size; (3) its position; (4) the time it has been lodged in the joint; (5) the presence or absence of infection.

The nature of the foreign body.—As a general rule, rifle and shrapnel bullets may be left inside without much risk of infection, granted that the joint is properly immobilised. But a careful watch should always be kept for the onset of sepsis. In the case of shell fragments, however, it is a different matter; these as a general rule, especially when large, are best removed as early as possible and at the first opportunity. But due consideration must be paid to the facts described below.

Size.—Small foreign bodies we have usually left severely alone, and practically speaking they have never given rise to any trouble. The risk associated with a prolonged search shortly after injury appears to us to be too great to justify operation, more especially as quite a number of such fragments cannot be found.

Position.—A foreign body, whatever its nature, when deeply embedded in bone is usually best left entirely alone, especially shortly after injury, owing to the risk of lighting up sepsis. Most of these can be left permanently in place. When foreign bodies are readily accessible and can be removed without much disturbance there is no great risk in interference, but when they lie in an inaccessible situation—i.e., in the posterior part of the joint close to the inter-condyloid notch—and are small, no attempt to interfere should be made owing to the difficulty in finding them.

Time the body has been lodged in the joint.—The best time for the removal of foreign bodies is undoubtedly immediately after the injury. If not removed within two or three days of the injury, foreign bodies are best left for several months till all risk of infection has died away.

Relation of foreign bodies to sepsis.—A foreign body in a septic joint should always be immediately removed if possible and the joint cavity carefully washed out. The subsequent closing up or leaving open of the joint must be decided by the bacteriological findings, the general condition of the patient, and the local condition found at operation.

Method of Operation.

Before proceeding to remove the foreign body the original wound should be excised down to and including the capsule and carefully covered up. The limb is then most carefully resterilised. The foreign body should not be removed through the original wound, unless it lies immediately under it, but through a fresh incision. The position of this depends on the site of the foreign body as revealed by X ray examination; generally speaking, this is that used for removal of a loose cartilage; but if the foreign body is lodged behind the condyle it may be better to make a vertical incision over the joint interval just anterior to the corresponding hamstring tendon. After removal the joint cavity is most carefully washed out without force, and the wound sewn up in layers as described previously.

Foreign bodies lying close to the joint.—The question of the treatment of these cases is a difficult one; a number of these (5 in our last series of 67 cases) give rise to a septic arthritis from secondary spread of the infection into the joint cavity. Many advocate immediate removal of all foreign bodies in such a situation, but we ourselves prefer to leave them alone unless they are causing actual trouble owing to the danger of opening the joint during operations and lighting up the sepsis in the neighbourhood. Under such circumstances we carefully immobilise the limb. The only exception we make to this is when we are dealing with a large foreign body.

Fractures secondarily involving the knee-joint should be treated in exactly the same way as other serious knee-joint cases, taking particular care to apply elastic pressure, continuous if possible, over the joint, so as to allow of locking off of the general synovial cavity by adhesions. If the wounds are at all septic they should be excised, all tension relieved and free drainage of the fracture provided. If an infective arthritis arises this does not by any means necessitate amputation—drainage of the joint often suffices.

Use of the tourniquet at operations.—We never perform any operation on the knee-joint without using a tourniquet for the following two reasons: 1. Ligatures are never used, and hence their action as foreign bodies is avoided. 2. All bleeding into the joint cavity is prevented, not only at the time of the operation but also subsequently, granted that the limb is *very firmly* bandaged and completely immobilised before the tourniquet is removed. We feel sure that one cause of failure in some of the earlier cases that we treated was due to extravasation of blood into the joint cavity, after the application of the bandage, the clot subsequently becoming infected and so preventing the formation of adhesions.

After the primary operation and the limb has once been efficiently mounted in a Thomas's knee splint, it has been our practice invariably to perform any subsequent operation without removing the splint, so as to cause as little disturbance as possible to the joint.

Conclusions as to Treatment.

That the above methods of treatment (exclusive of excision of the joint) yield the best results we have no doubt at all; indeed, others who have followed out the details of our treatment have noticed precisely the same and have been surprised at the superiority of the results over those attained by other methods. No two cases are actually alike—each one has to be judged on its merits and in the light of past experience, and treated accordingly.

Comparison with the saline method of treatment.—Earlier on we treated our cases by the saline method. Comparing the last series of results so gained with those obtained recently when using Carrel's method, we find that in the latter the mortality is reduced to one-fourth and the number requiring amputation to one-eighth, although the cases treated by Carrel's method were, if anything, more severe.

Excision of the joint as a method of treatment in septic arthritis.—Excision of the joint is being largely advocated at the present time for the treatment of infective arthritis. Our own experience of this method is very limited indeed, but we are told by several who have used it on a fair number of occasions that it is attended by a high mortality and not infrequently by amputation. We cannot help thinking that the exposure of large surfaces of newly cut bone to severe infection is a highly dangerous procedure, more particularly when, as so often happens, the infection in the bone has been already localised. In mildly septic cases we can quite imagine it would be successful. Very few surgeons, we

venture to think, would care to interfere in such a drastic way with an ordinary septic compound fracture of several days' duration owing to the risk of septicæmia and diffuse osteo-myelitis.

In view of this and our recent results we cannot help thinking that the above methods are more satisfactory and much more devoid of serious risk, and hence should be the treatment of choice. That similar results can be readily obtained there is no doubt, for others who have carefully followed out the above methods of treatment have obtained equally good results.

In conclusion, we have to thank Lieutenant-Colonel J. Hay Campbell, D.S.O., R.A.M.C., our commanding officer, for the opportunity of recording these cases, and for the assistance he has always given us in the work, and also Sisters Wilson and Bailey, who, in succession, had nearly all the cases under their care, and to whose skill the success attained has been in no small measure due.

Summary of Treatment.

		Cured.	Died.	Amputated.
Fully drained (by lateral and posterior incisions)	7	6	—	1
Patella excised	3	2*	—	—
Carrel's tubes inserted locally into joint	11	11	—	—
Carrel's tubes applied to wound surface	9	8	1†	—
Wounds excised only	13	13	—	—
Joint washed out and closed	3	1‡	—	—
Joint excised	2	1	1§	—
Retained foreign bodies	17	17	—	—
Left untouched	3	3	—	—
Removed	11	10¶	—	—
Not found at operation and left in site	1	1	—	—
Retained in bone	2	2	—	—

* The third had the joint excised later. † Secondary hæmorrhage.
‡ Two were fully drained later. § Septicæmia.
¶ The other had the joint excised later.

FIG. 1 (Case 3).

Six weeks after draining the knee-joint laterally and posteriorly. The larger portion of the internal condyle of the femur was removed at the time of operation. New bone formation can be seen, also two Carrel's tubes *in situ*. Cured.

FIG. 2 (Case 13).

Showing fracture of femur and foreign bodies. The knee-joint was freely opened. Carrel's tubes applied locally to wounds. Cured.

FIG. 3 (Case 17).

Showing fracture of external condyle at site of entrance wound. Carrel's tubes applied locally to wound. Cured.

Detailed Enumeration of Several very Severe Cases.

CASE 1.—Sergeant M. Admitted with multiple wounds. There was a penetrating wound in each popliteal space and the adjacent parts of thigh and calf had already been opened up freely for cellulitis. Each knee-joint was considerably swollen, hot and acutely tender and painful. The general condition of the patient was bad—he was practically moribund—acutely delirious, temperature 103° F., pulse 130, tongue dry and furred. X ray examinations showed in one knee a shell fragment lying in the inter-condyloid space of the femur, in the other knee a shell fragment lodged in the substance of the external condyle of the femur. Bacteriological examination of the contents of the joint showed numerous streptococci.

Operation.—Both knee-joints were drained by lateral and posterior incisions and covered Carrel's tubes were inserted into the joints, anteriorly four from side to side, laterally two from front to back, one under cover of each lateral ligament. Similar tubes were also laid on the surface of the incisions.

The patient was dressed once every two days. After about 12 days the patient's delirium disappeared and his tongue became moist. He remained desperately ill for about five weeks, with intermittent temperature ranging to 103·2°, but did not lose much flesh, and then began to improve slowly. Several incisions were required in the calf for suppuration. After the twelfth week he was evacuated to England with commencing ankylosis in each joint and with all incisions healed save the original ones made in the popliteal spaces for relief of the cellulitis.

Three months later the patient was finally discharged from hospital and was able to get about. The joints were firmly ankylosed, but there was a small sinus behind each knee and some persistent œdema of each leg.

CASE 2.—Corporal R. Admitted 54 hours after being wounded with a shell fragment. The entrance wound was about 2 in. in diameter, on the inner and upper side of the right patella, and the exit wound, with gangrenous and stinking edges, on the postero-internal aspect of the joint, was about 3 in. in diameter. The popliteal vessels and nerves had escaped injury. The greater part of the internal epicondyle and adjacent parts of the shaft of the femur were severely fractured and separated from the rest of the bone. The general joint cavity was acutely infected and exuding sero-pus containing streptococci and staphylococci.

Operation.—The wounds were excised as fully as possible and the separated portions of condyle and shaft removed. The joint was drained by lateral and posterior incision, and covered Carrel's tubes inserted as described in Case 1. On the second day the covered tubes were replaced by uncovered ones, and the joint cavity was locked off by adhesions. On the fourth day the tubes in front were removed completely. On the sixth day the whole of the front part of the joint cavity was occluded by firm adhesions and the lateral tubes were removed altogether. Three weeks later the intermittent temperature, which had ranged to 102·4°, had sunk to normal and the knee was practically completely healed save for a small sinus leading down to bare bone at the site of fracture.

At the end of the fifth week the patient developed local spasms in the limb which later progressed into a generalised tetanus. Anti-tetanic serum was administered in large doses and produced alarming signs of anaphylaxis. Under treatment all spasms ceased at the end of seven days and the patient was discharged to England 16 days later completely healed save for a small sinus leading down to bare bone. X ray examination at this time showed commencing bony ankylosis.

CASE 9.—Private S. Admitted with a shell wound causing a fairly severe gouged out transverse fracture of the front of the tibia three-quarters of an inch below the articular surface and extending upwards into the knee-joint. The wound had been excised in the casualty clearing station and sewn up completely. On admission the wound was severely septic and the joint cavity slightly distended. Clear (?) synovial fluid was escaping through the wound. Temperature 99° F., pulse 96. The patient looked fairly well. Anaerobes, staphylococci, and streptococci were cultivated from the wound. Carrel's tubes were applied to the wound surface and the limb efficiently immobilised and extended and very firmly bandaged. The patient, however, became rapidly worse, and turbid synovial fluid mixed with pus could be expressed from the distended joint cavity by very gentle pressure. On the seventh day after admission the patient was gravely ill. Temperature 103° F., pulse 120. Tongue foul and dry. The joint was explored with a needle; the fluid withdrawn was heavily infected with *Staphylococcus aureus* and *B. perfringens*.

Operation.—The wound was excised and necrotic tibia gouged away until bleeding cancellous bone was laid bare. The joint was then fully drained by lateral and posterior incisions and covered Carrel's tubes inserted as described above.

Second day: Temperature 103°, pulse 118. Tongue foul and dry. Dressed; covered tubes removed and replaced by uncovered ones. All the anterior part of the joint was sealed off by well-formed adhesions.

Fourth day: Temperature 97·6°, pulse 112. Tongue cleaner and somewhat moist. Feeling somewhat better. All anterior tubes removed, but the lateral ones left *in situ*.

Sixth day: Temperature 99°, pulse 100. Tongue fairly moist. Could take his food fairly well. General appearance much improved. Dressed, and lateral tubes removed completely. Anterior part of joint entirely obliterated.

From this time onwards the patient made an uninterrupted convalescence, and at the end of the six weeks the temperature was practically normal and all the wounds were healed save for a small sinus in the original wound going down to the front of the tibia and to a small patch of bare bone.

During the entire period of healing tubes were applied to the granulating surface of the incision and also placed in the posterior incisions down to, but not into, the joint.

CASE 8.—Private P. Wounded Oct. 9th. Multiple shell wounds. Oct. 10th: Operation in casualty clearing station. Right leg amputated just below the middle; left knee widely opened by a large U-shaped incision, the flap so formed including the patella. No attempt had been made to close the incision, so that five days later, when the patient was admitted, it was about four and a half inches long and two and a half wide. Almost the whole of the trochlear and adjacent part of the condylar surfaces of the femur were exposed. The sides of the incision were stinking and gassy and sloughing extensively. The sub-crural pouch was exuding pus in large quantity. The amputation stump was the seat of a severe cellulitis and extensive tracking along the fascial planes. The patient was in poor condition, thin and pale.

On the chance that the posterior part of the joint was not infected, no posterior incisions were made. Carrel's tubes were passed upwards into the sub-crural pouch, and backwards under cover of the lateral ligaments as far as possible. They were also laid over the entire extent of the wound.

Oct. 18th: Sub-crural pouch completely sealed off and the wound rapidly cleaning. Oct. 26th: Anterior wound perfectly clean; practically no pus formation. Oct. 28th: Lateral tubes not replaced; some œdema and tenderness in the popliteal space. Small incision made into same; pus found. Considerable tracking in stump. Temperature since admission had ranged to 102° F.

Nov. 18th: Patient has been going rapidly downhill the last fortnight, and taking his food very badly the last few days. Tenderness in popliteal space more marked. Some pus coming from behind, under cover of the lateral ligaments. Temperature falling and pulse-rate rising.

Operation.—Posterior drainage instituted and Carrel's tubes pushed backwards under cover of the lateral ligaments and into the posterior incisions.

Nov. 24th: General condition rapidly improving. Anterior wound entirely free from pus since last operation. Tubes removed entirely from under cover of the lateral ligaments, but still placed in posterior incisions down to the joint capsule.

From this time onwards the patient made an uninterrupted convalescence save for a small abscess which formed on the upper part of the calf, deep to the gastrocnemius, and was opened.

Jan. 20th, 1917: Discharged to England completely healed, with firm bony ankylosis. Has had a normal temperature for nearly a month.

Note by Surgeon-General Sir GEORGE H. MAKINS, A.M.S.

The contribution by Captain Campbell and Major Woolfenden was read at a meeting of the Etaples Medical Society in November, 1916. Since that period a much more complete and energetic method of treatment has been adopted at the casualty clearing stations which has done much to reduce the number of cases of suppurative arthritis in the general hospitals. None the less, early radical intervention has by no means eliminated this most dangerous consequence of gunshot wounds of the knee-joint, and the paper is most valuable in showing, as it does, what may be effected by scrupulous care and judgment in saving the limbs and lives of patients in whom severe infection has occurred. The general principles enforced are those which should dominate the treatment of any suppurating articulation, while to them are added a wealth of details as to the practical treatment of both the external coverings and the joint cavity itself. Of these the most important are the rules for the regularisation of a method ensuring the drainage and sterilisation of the posterior extensions of the synovial cavity, and the cases quoted amply demonstrate the utility of the system devised. A second series of 69 cases treated in an identical manner by Captain Gill in a neighbouring unit furnished equally good results.

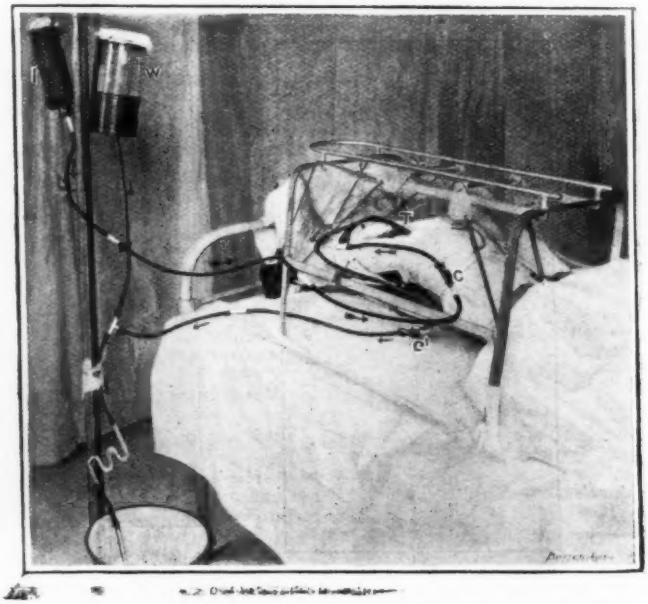
IRRIGATION AND SUCTION DRAINAGE FOR TREATMENT OF CERTAIN WAR WOUNDS.

BY GEORGE C. SNEYD, F.R.C.S. IREL.,
LADY CARNARVON'S HOSPITAL FOR OFFICERS, BRYANSTON SQUARE, W.

IT is generally recognised that the Carrel method of treatment is sound in that it furnishes an excellent means of irrigation in the case of septic wounds. In wounds of a cavernous type where a large retentive septic space is present and where counter-drainage is anatomically impossible I have adopted the use of a suction apparatus to surmount the difficulty of drainage, at the same time using Carrel's tubes for irrigation. The suction apparatus is on the principle of the Sprengel pump, as advocated by Cathcart some years ago in bladder cases. Having noticed its success in one case and considerable improvement in another now under treatment, I would suggest that this method could be given a more extensive trial in similar cases. The two cases I refer to are as follows:—

CASE 1.—Capt. ——. Compound fracture, comminuted, tibia and fibula. Some loss of bony substance. Operation April 28th. Portion of bare tibia cut away to allow of correct position. Extensive area of upper and lower tibial fragments bare of periosteum, medullary cavities filled with pus. Much inflammation in leg. Wound contents, 1 oz. of pus. Five weeks later the wound healed, with the exception of a small sinus. There is much less necrosis of bone than was expected—one small sequestrum. Normal temperature maintained.

CASE 2.—Lieutenant ——. Compound fracture of tibia; 2½ inches of tibial substance was shot away, leaving only the posterior wall of tibia. Wound content at beginning of treatment 9 drachms of pus. Microscopic field count, staphylococci and streptococci, 30. Eight days later the wound content was 6 drachms. Microscopic field (mainly staphylococci) 5 per field. The wound now has a healthy appearance. Normal temperature maintained.



Illustrates apparatus (applied to Case 2). I, Irrigation solution; W, water reservoir; T, Carrel's tubes; C, clip for patient; C', clip for temporarily stopping suction.

The irrigation fluid chiefly used was Dakin's solution, occasionally normal saline or sterile water, on an average 12 times in 24 hours. The clips are near the patient so that he himself may attend to the apparatus day or night. The wound is surrounded by vaseline-impregnated lint (sterile). The suction tube has no sharp edge and has a lateral hole ¼ inch distant from its termination, which hole lies on the bottom of the wound. The clip on the suction

tube allows the wound to remain filled with fluid for any chosen period, thus forming a temporary bath for the wound.

In my opinion the Carrel tubes are the best means of irrigation, as the sides of the wound are gently sprayed at each time of irrigation. The wound can be thoroughly cleansed at each time of douching, thus allowing the fluid to act in a cleaner medium at each application. The frequent cleansing prevents accumulation of pus, dilutes any pus that may be present in any small recesses, and so diminishes local absorption and local toxic effect of the wound discharge on bare bone, thus minimising necrosis of the bone. The infected walls have no chance of becoming dry, and therefore the outflow of bactericidal lymph is maintained and repair is hastened. The danger of infection spreading is also reduced. The patient takes an interest in his wound, and can do most of his own nursing. The wound is covered by a single layer of sterile gauze. I consider it inadvisable to use the apparatus if any vessel is exposed in the wound.

THERMALGIA (CAUSALGIA).

BY JOHN S. B. STOPFORD, M.D.,

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(*Report to the Medical Research Committee.*)

THIS most distressing condition was described first by Weir Mitchell [1] as occurring in the American Civil War, and since that time has borne the somewhat misleading name causalgia, derived from the Greek, καυσός = heat + ἄλγος = pain, on account of the intense burning pain which is its most characteristic and urgent symptom.

The name causalgia has probably prevented the condition being more widely recognised, and since it is liable to be misleading I suggest the substitution of the more obvious name thermalgia.

The two factors which provide the great differences between gunshot and civil injuries of nerves—namely, the frequency of partial division and the excessive formation of scar tissue in the former—are sufficient to explain its commoner occurrence in military practice. Nevertheless it is not easy, at first sight, to understand why its appearance is practically limited to injuries of the median and sciatic nerves. To attempt to solve this problem and decide upon the most beneficial treatment it is advantageous to follow the subject from three points of view.

A. *Clinical.*

From the study of a large number of cases it is clear that thermalgia, as generally described, is only an extreme type of many median and sciatic injuries, and to determine the etiology it is necessary to investigate all cases in which pain is the predominant and constant symptom. The following cases illustrate the fact that the associated signs and symptoms of painful median and sciatic injuries vary very considerably.

CASE 1.—Patient was wounded by a machine-gun bullet on August 9th, 1916, the missile passing obliquely through the right thigh behind the femur, about 3½ inches above the condyles, and he immediately lost all voluntary control over the foot and toes. The wound rapidly healed without suppuration. Five days after the injury he began to suffer in the foot from pain, which persisted constantly until operation. The pain was of a "stabbing" character and of maximum intensity in the heel and sole. The pain got progressively worse, until when I first saw him, early in October, it was intolerable, and he had scarcely slept for a fortnight. Warmth or the slightest movement increased the pain, and the only thing which gave the least relief was a cold, wet application. The skin of the sole and around the heel was thin, smooth, and erythematous. Perspiration was excessive from the sole and the slightest pressure in this region caused extreme pain. There was marked paresis of all the muscles distal to the knee. No loss of any form of sensibility was to be discovered, but pressure on the posterior tibial nerve caused a "shock" to strike down into the heel.

At the operation on Oct. 18th, performed by Captain W. R. Douglas, it was found that a few of the inner fibres of the internal popliteal nerve had been divided and a small detached piece was projecting. There was a moderate amount of perineural fibrosis and, when this had been dissected off, the nerve was seen to be considerably swollen at the site of the injury.

During the next few days he suffered from a throbbing pain in the foot, but it was not so severe or constant as formerly. On Nov. 1st the pain was decidedly better, the excessive sweating had diminished, and the sole was much less tender. On Nov. 8th he was able to extend the ankle easily without pain and the sole was no longer sore or erythematous. The tenderness of the posterior tibial nerve gradually subsided.

He was given ionisation daily, which appeared to accelerate the return of power and relieve the slight occasional attacks of pain, so that by the end of January he was able to get about, and had merely some paresis of the deep calf muscles and a little discomfort when his full weight was placed on the foot.

CASE 2.—Patient was wounded on Sept. 14th, 1916, by a rifle bullet, which passed transversely through the upper part of the left thigh behind the femur. There was immediate loss of power distal to the knee. The wound healed in one month without suppuration. Within a few days of receiving the wound he began to suffer from a "throbbing" pain in the foot, which became more severe and was always increased by heat or the least movement, as when he laughed or coughed. He obtained some relief by keeping the leg absolutely still with the knee partially flexed.

When seen on Nov. 1st he obviously had severe pain in the sole of the foot, but it did not appear so agonising as in the previous case. The skin of the sole was not noticeably different from that on the sound side and there was no abnormal sweating. No objective sensory symptoms were present, but pressure on the sole caused a "battery sensation in the foot," and pressure on the sciatic (distal to the lesion) or posterior tibial nerves caused an intense, sharp, local pain, which later shot down into the foot. There was no tenderness of the anterior tibial nerve. There was no voluntary contraction of any muscle except a slight movement in the tibialis anticus and extensor longus hallucis.

At the operation, performed by Captain W. R. Douglas on Nov. 15th, a small intraneural scar was found on the inner side of the sciatic nerve, which was densely adherent to adjacent muscles anteriorly and internally. During the process of clearing the perineural scar and freeing the nerve a large blood clot was found encapsuled in fibrous tissue. The nerve was wrapped in fat, and a piece of undamaged muscle sutured over it.

The pain ceased, except for an occasional minor attack, within three days. Voluntary movement and power steadily improved in the extensors of the ankle and toes, but by the middle of February there was no return of contraction in the superficial or deep calf muscles. He was treated daily with ionisation from early in January. In April there was practically a return of full power in all the muscles, and he was quite free from pain even after walking.

CASE 3.—Patient was wounded on Sept. 27th, 1916, by a piece of shrapnel, which transversely pierced the right thigh behind the femur. The wound suppurated for some weeks and was irrigated daily through drainage-tubes. As soon as the wound began to heal he suffered from severe and persistent pain in the foot, and states that for several weeks the foot was bathed in sweat.

When seen early in January, 1917, he still complained of constant pain in the foot. He was extremely emotional, and on this account it was very difficult to make a satisfactory examination. No loss of sensibility could be discovered, but there was marked tenderness to the slightest pressure on the sole and dorsum of the foot, and the skin of the former was hyperæmic, smooth, and thin. On palpation the sciatic and posterior tibial nerves were very tender. There was marked paresis of all the muscles distal to the knee-joint, possibly in part due to the induction of pain on movement.

At the operation on Jan. 6th, 1917, performed by Mr. Stocks, dense adhesions were found on the anterior and inner aspects of the sciatic nerve, and, on freeing these, a few of the inner fibres were seen to have been divided. After neurolysis the nerve was wrapped in fat and protected by uninjured muscle.

On Jan. 25th the pain was definitely better, and, although the patient was still very emotional, he stated it was gradually diminishing. There was only slight tenderness of the sole, and voluntary power had much improved. It is interesting to note that at this time all the muscles responded briskly to faradism and normally to galvanism.

On Feb. 28th the pain had almost disappeared, and there was no tenderness of the sole of the foot, although the posterior tibial nerve was still painful on pressure. The muscles had practically regained their normal power.

CASE 4.—Patient was injured on Oct. 8th, 1916, by a piece of shrapnel, which penetrated the inner part of the left upper arm without damaging the humerus. Severe pain commenced in the hand in five hours, and was continuous up to the time of operation.

When seen on Nov. 4th he was obviously in terrible pain. He kept the elbow flexed and the wrist acutely flexed in order to obtain slight relief, apparently from relaxation of the nerve. He described the pain as of a "throbbing" character, worst in the centre of the palm, and said it became intolerable on the slightest movement (or even the prospect of movement) or if the elbow or wrist were passively extended. A splint was quite unbearable. In the median area there was dissociated sensory loss of the compression type,[2] as shown in Fig. 1. The most trivial pressure on the distal part of the palm or affected fingers and thumb induced acute pain. Pressure over the median nerve in the forearm caused a pain to shoot down into the fingers. The skin of the median area was dry and scaly.

In this case the pain was not relieved by cold applications. The severity of the pain rendered it impossible to test the motor power, but he assured me that he had not been able to flex the thumb and first two fingers since the infliction of the wound.

At the operation on Nov. 7th, performed by Captain J. Morley, the median nerve was found to be more than half divided and recent scar tissue was discovered between the severed ends and around the nerve in this region. About 1½ inches of the nerve was excised and the ends sutured.

He was completely free from pain on recovering from the anæsthetic, and it is of interest to note that when I tested sensation on Nov. 22nd the dissociation was then found to be that of complete division. (Fig. 2.)

CASE 5.—Patient was wounded on July 7th, 1916, by an explosive bullet, which obliquely traversed the middle of the left forearm, the exit wound being situated in the middle of the anterior aspect. There was only very slight suppuration, but the entrance wound broke down several times. A few days after the injury persistent spasm of the thenar muscles developed (Fig. 3), and about the same time he began to suffer from severe pain "like a battery" in the first three fingers.

When examined on Nov. 13th it was possible to overcome the thenar spasm by massage, but it immediately recurred. There was paresis of the flexor longus pollicis and the flexor sublimis digitorum. The thenar muscles responded to faradism, but not so briskly as on the sound side. The sensory loss is represented in Fig 4. The skin of the anæsthetic area was dry and scaly. The pain was not much relieved by cold.

At the operation, performed on Nov. 15th by Captain W. R. Douglas, two-thirds of the median nerve was found to be severed on the inner side and the undivided fibres were embedded in scar tissue. The latter

was carefully dissected away and, after the divided fibres had been refreshed and sutured, the nerve was protected by uninjured muscle.

On Nov. 23rd slight spasm was still present, but it could easily be overcome and the thenar muscles could be voluntarily contracted. The pain was much relieved. Unfortunately, owing to transference to another hospital, I was prevented from following the case further.

CASE 6.—Patient received several shrapnel injuries of the left forearm on July 25th, 1916, and one small piece was immediately removed. All the wounds healed without suppuration. Almost immediately after the reception of the injuries he began to suffer from a throbbing pain in the thumb and first three fingers. At first this was accompanied by profuse sweating of the palm of the hand.

When first seen on Jan. 27th, 1917, he was suffering from a severe continuous pain in the palm. The skin of the median area was rosy pink in colour, thin, and glossy, and the slightest pressure gave acute pain. Compression of the median nerve was also painful. No loss of sensibility was present in the distribution of the median. There was complete sensory loss in the ulnar area (dissociation of complete division), and the skin in this region was dry, thick, anæmic, and in marked contrast to the median area. There was paralysis with atrophy of all the muscles supplied by the ulnar nerve distal to the lesion, and also of the flexor longus pollicis. In addition, there was paresis of the flexor sublimis digitorum and the thenar muscles.

At the operation on Feb. 8th, performed by Captain W. B. Douglas, both the ulnar and median nerves were found to be embedded in scar tissue. The ulnar was completely divided and secondary suture was required; only a very few fibres of the median had been severed, but posteriorly there were dense adhesions. After neurolysis the nerve was carefully protected by fat.

On Feb. 15th the pain had wonderfully improved and the patient stated he had experienced great relief within a few hours of regaining consciousness. On March 7th he was practically free from pain, the flexor sublimis digitorum had recovered, and there was moderate power now in the flexor longus pollicis. The skin of the median area was quite normal except for a small patch of hyperæmia over the thenar eminence and there was no tenderness to pressure. This patient had Ionisation from Feb. 18th.

One frequently sees median, sciatic, or posterior tibial nerve injuries in which there has been a complete recovery from the paralytic and objective sensory symptoms, but where there is marked disability from manifestations, which suggest the same etiology as the foregoing cases. It is quite common to find tenderness, to even slight pressure, of the inner or outer borders of the foot as a residual symptom, which is persistent and sufficient to incapacitate the man from getting about, although the muscles may have regained their normal vigour. This tenderness is often associated with slight "glossy skin" or simply hyperæmia, and the patient usually complains of a throbbing pain in the foot which is made worse by warmth or dependency of the limb. These cases are very apt to be neglected or dismissed as hysterical, yet a careful examination will show that they are really milder forms of thermalgia.

It is not uncommon to obtain a history of pain, which suggests thermalgia, lasting for a period of a few days or even weeks and then passing off, usually with the development of more profound motor and sensory symptoms. These are cases where the excessive fibrosis has gradually strangled the undivided fibres and produced eventually the clinical picture of complete division.

The clinical symptom which is constant and characteristic in all these cases is the "bursting," "throbbing," or "burning" pain in the hand or foot. The affected part is generally swollen or doughy and the temperature of the skin higher than on the normal side. Often the appearance of the hand or foot suggests the presence of deep suppuration in the palm or sole. The pain is usually persistent, intractable, and in its severest form sufficient to render the patient emotional or even to drive him to suicidal tendencies. It is made worse by heat, movement, excitement, or the dependent position, and as a result any treatment for the paralysed muscles is impossible as long as the pain persists. The only thing which appears to render the least relief is cold, and this fails if there is a marked loss of sensibility.

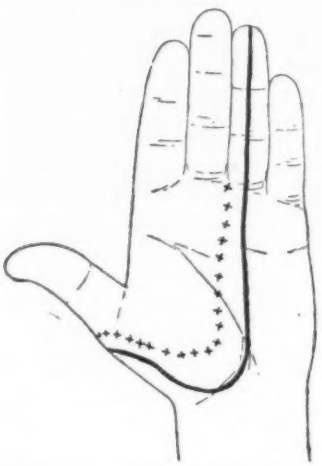
The associated symptoms are by no means constant and depend considerably upon the number of fibres divided. In most cases they are characterised by manifestations of nerve irritation as glossy skin, hyperidrosis, hyperæmia, and bone and joint changes. As a result of the arthritic changes and the inability to treat the paralysed muscles most distressing and unsightly deformities occur in the later stages of neglected cases. (Fig. 5.)

B. *Pathological.*

From the appearance at operations and microscopic examinations of excised portions of nerve it is evident that two constant conditions are found in thermalgia—first, partial division, and secondly intraneural fibrosis. It is customary during surgical procedures to find the nerve densely adherent to surrounding structures at the site of laceration, with a variable amount of perineural scar-tissue extending some distance proximal and distal to this point. It is only with difficulty that this extraneural sclerosis is effectively cleared and, when this is accomplished, the nerve is seen to be swollen and of firmer consistency in the region of the injury than elsewhere. There is also increased vascularity, as evidenced by the colour of the nerve and the aggravating oozing which occurs during neurolysis from the divided capillaries which can be seen entering the nerve from the scar. In the cases following sciatic injury it is important to recognise that in all instances the internal popliteal element is the one invariably affected, with or without the external popliteal fibres.

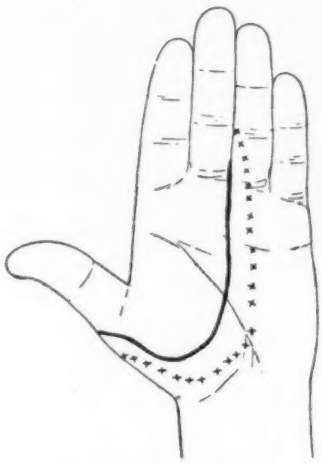
From microscopic examination with the low power it is found that the nerve bundles are widely separated by fibrous tissue (Fig. 6) which in the later stages can be seen to be contracting down and compressing the nerve bundles. The sheaths of the bundles in closest relation to the lacerated fibres are seen to be ruptured and the scar tissue gaining entrance to and invading their interior. With higher magnification newly formed fibrous tissue can be seen within the bundles between individual nerve fibres, which gives a

FIG. 1.



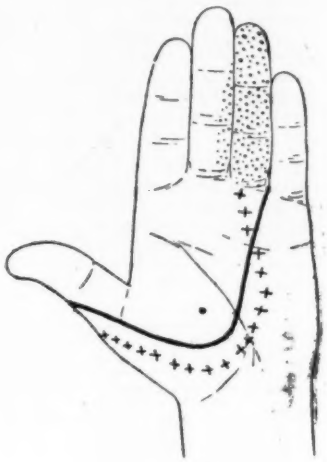
Sensory loss before operation in Case 4. Dissociation of compression.
Crosses = analgesia.

FIG. 2.



Sensory loss after operation in Case 4. Dissociation of division.
Thick line = anæsthesia.

FIG. 4.



Sensory loss in Case 5.
Dots = hypoæsthesia.

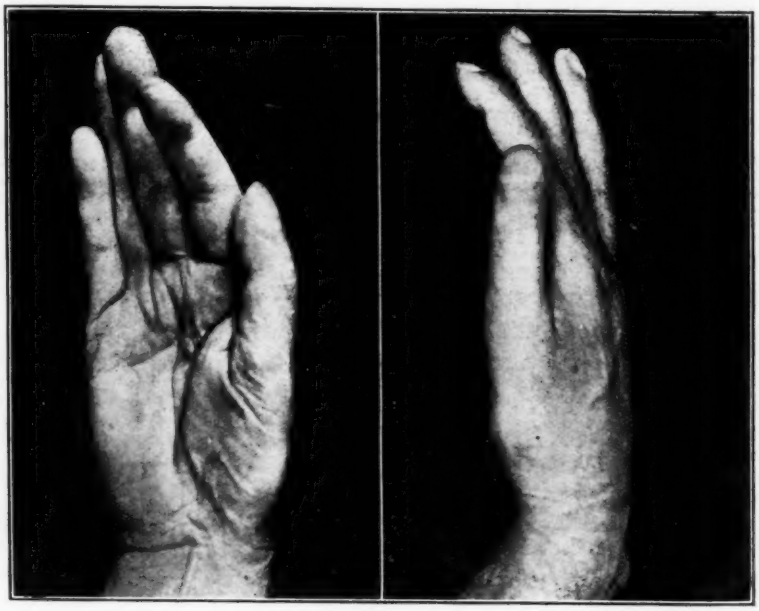
similar appearance to that found in the liver in the pericellular cirrhosis of syphilis. Some of the nerve fibres are strangled by the sclerotic tissue, but the proportion so affected will depend upon the time which has elapsed between the reception of the wound and excision of the piece of nerve for examination. The newly formed fibrous tissue does not seem to differ in any particular from scar tissue elsewhere, nor does the condition just described vary in the least from that found in the histological examination of nerves, other than the median or sciatic, which have been partially severed by the various missiles.

We know that modern projectiles, as a result of their "spread action," cause extensive laceration and consequent hæmorrhage into the surrounding tissues. It seems likely that, since the missile invariably lacerates some fibres in these cases, it causes rupture of the sheath of neighbouring bundles, and the resultant hæmorrhage is not only around the nerve but even percolates between the constituent fibres of the bundle, and, of course, this will be further increased by laceration of the vasa nervorum. This intraneural effusion of blood is the probable cause of the early onset of pain. Later the blood clot becomes organised and the granulation tissue in and around the nerve, by its growth and subsequent contraction, maintains the irritation and pain. The sclerosis is naturally still further increased when the condition is complicated by septic infection, but this is certainly not a necessary factor in its production. These facts fail to explain why thermalgia is confined to injuries of the median nerve or internal popliteal fibres, although it explains the not infrequent appearance of other irritative symptoms in partial division of other nerves.

FIG. 3.

Reproduction of photograph showing spasm of thenar muscles and position of wound in Case 5.

FIG. 5A. FIG. 5B.



To show deformities due to arthritic changes in a neglected case.

C. *Anatomical and Physiological.*

It is extremely unlikely that the pain can be simply the result of irritation of fibres subserving common sensibility, because the pain is not of a neuralgic type and quite different from that due to irritation of a purely sensory nerve.

Anatomically the median and internal popliteal or posterior tibial nerves differ from other nerves of the limbs in containing proportionately a larger number of vaso-motor fibres for the supply of the superficial palmar and plantar arches with their respective digital vessels.[3,4] These arteries, as is to be expected from their anatomical position in the circulation of the limbs, receive a very much richer nerve-supply than the larger and more proximal vessels. The suggestion that the pain is a result of some interference of vaso-motor control is supported by the "bursting" character of the pain and the "throbbing" in the palm or sole, the increase of pain when the part is dependent or moved, and also by the fact that a somewhat similar pain is occasionally found in irritative lesions of the ulnar nerve, whose deep branch supplies the deep palmar arch. Furthermore, elevation of surface temperature is an associated symptom usually accompanied by hyperæmia of the skin.

Irritation of vaso-constrictor fibres would cause constriction of the vessels, which would be manifested chiefly by blanching of the skin and a lowered surface temperature. Instead of that there is hyperæmia, elevation of temperature, and the condition is generally relieved by cold applications, which reflexly cause constriction of superficial vessels. Clearly everything points to the constant presence of vaso-dilatation, but the mechanism by which this is induced is not so easily discovered. At least three possibilities suggest themselves.

1. *Paralysis of vaso-constrictor fibres.*—We know that after experimental division of the sciatic nerve the vaso-dilators degenerate more slowly, and retain their irritability longer, than the vaso-constrictors.[5] This possibility appears very improbable as the cause of the vaso-dilatation when it is remembered that thermalgia frequently persists for months and that the essential pathological lesion is partial division with irritation from intraneural sclerosis.

2. *Direct irritation of vaso-dilator fibres.*—Opposed to this supposition is the fact that irritation of both sets of fibres (constrictor and dilator) together would cause vaso-constriction; therefore, to uphold this contention, it would be necessary to have either paralysis of the constrictors associated with irritation of the dilators or the irritation would have to act specifically upon the latter. Obviously such conditions are not practicable, nor do the histological findings in any way support them.

3. *Reflex vaso-dilatation.*—This suggestion appears more tenable because it does not require the supposition that the irritation is selective in its action on the component fibres of

the nerve, nor does it necessarily depend upon the presence or absence of vaso-dilator fibres, a question which still provokes discussion. Both pressor and depressor fibres have been shown to exist in most of the large nerve trunks.[6]

Cold reflexly causes vaso-constriction, heat vaso-dilatation. It seems reasonable to suppose that, as a protective and defensive mechanism, irritation will cause a depressor effect.

The increased severity of the pain resulting from the mere prospect of movement or excitement is able to be understood and appreciated more clearly, since by the above supposition it can be explained as a psychical depressor effect.

It is necessary to refer briefly to two theories which have been advanced as an explanation of thermalgia. In the first it is suggested that the pain is the result of irritation of the periarterial sympathetic plexus and not directly due to injury of a nerve trunk. It is not uncommon for a median nerve injury to be complicated by involvement of the brachial artery in cases of thermalgia following wounds of the upper arm, but in most of the cases succeeding forearm injuries there is no implication of any vessel of importance. In thermalgia from sciatic injuries I have failed, at operation, to discover any indication of arterial complication. This theory is largely based upon the erroneous anatomical fact that sympathetic nerves are supplied to the vessels high up and pass proximally as a periarterial plexus, which supplies the branches to the coats of the vessels. This has been definitely disproved by the work of Kramer and Todd[3] and Potts,[4] who show that the arteries receive sympathetic fibres at irregular intervals down the limb from fairly constant nerve-trunks.

The second theory has been suggested by the presence of an unusually large nourishing artery to both the sciatic and the median nerves, the comes nervi ischiadici in the former and the median branch of the anterior interosseous artery in the latter. It is proposed that in thermalgia these vessels are implicated and consequently the blood-supply of the nerves seriously reduced. In the larger proportion of median injuries the lesion is proximal to the entrance of its nourishing vessel, either in the axilla or upper arm, and cases of thermalgia following posterior tibial nerve injuries can hardly be alleged to be due to any involvement of the comes nervi ischiadici.

Treatment.

The severe pain is the urgent symptom, but in treating this it is important to remember the pathological condition which gives rise to it—partial division with increasing perineural and intraneural sclerosis. Since usually only a few fibres are severed our aim must be not only to relieve the pain but also to conserve the undivided fibres, and, as far as possible, diminish the sclerosis. Only operative measures can achieve this satisfactorily, and to obtain the best results they must be adopted at the earliest opportunity; in fact, as soon as the risk of sepsis can be eliminated. The indications for early operation are the agonising pain—which wears the patient mentally and physically and may persist for months, and so prevent the paralysed muscles being treated—and the permanent disabilities, motor, sensory, and vascular, which are frequently the result of the progressive fibrosis.

The essential factors in successful operative treatment appear to be: First, careful separation of all adhesions around the nerve and absolute clearing of all perineural fibrosis. Secondly, complete hæmostasis to reduce the resultant scar as much as possible. Thirdly, protection of the nerve at the site of injury to prevent recurrent adhesions. Fat seems to serve this purpose best, since it minimises the risk of the formation of a thick fibrous sheath around the nerve, which so commonly follows the use of other tissues or extraneous materials. Failing to procure fat, it is best to suture the injured muscles so that no raw surfaces are exposed and only undamaged portions are in contact with the nerve. From personal observations it has been proved that this is preferable to substituting any other material for fat.

FIG. 6 A.

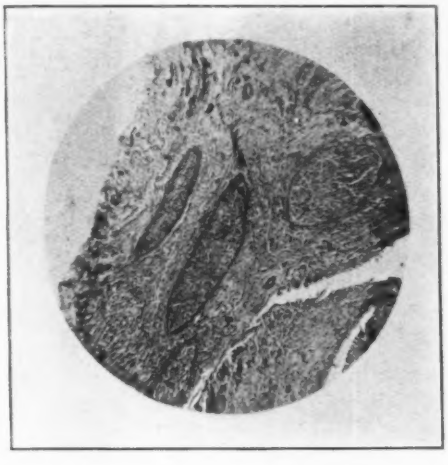
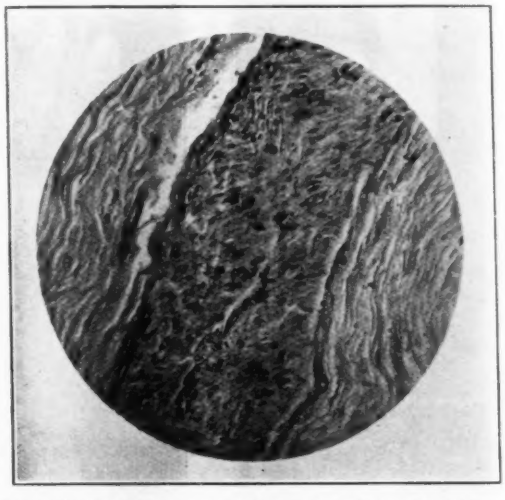


FIG. 6 B.



Microphotographs of excised portion of nerve in Case 4. Fig. 6 A shows perifascicular sclerosis and compression of nerve bundles. Fig. 6 B shows intrafascicular sclerosis and strangulation of individual nerve fibres.

In the majority only a few nerve fibres are divided, and consequently this is all that is required. Suture of the few severed fibres is to be avoided on account of the risk of further irritation and recurrence of symptoms, and, furthermore, good functional results ensue without it. Therefore, where more than half the fibres have been divided, it is preferable in cases of thermalgia to excise the affected portion and perform secondary suture. This appears rather a drastic measure to advise, but in thermalgia study of the after-results following extensive laceration renders it justifiable.

It will be noticed that no reference has been made so far to treatment of the intraneural scar. It is obviously quite impracticable to attempt at the operation to dissect the individual nerve fibres free. Stoeffel[7] advises in the neurolysis of gunshot injuries, with intraneural scarring, a prolonged and delicate dissection to clear away the fibrous tissue within the substance of the nerve. On reading the reports of his technique it is apparent that he only attempts really to excise the fibrosis around nerve bundles and leaves the scar tissue investing individual nerve fibres, although many of his followers claim to also perform the latter. The microscopic examination of nerves with diffuse intraneural fibrosis is sufficiently convincing to show that it must be quite impracticable to excise even perifascicular scar tissue without lacerating a large number of nerve fibres. The inevitable capillary hæmorrhages which must necessarily

follow this operation and the good results which succeed less tedious procedures, even in thermalgia, not only contra-indicate intraneural dissection, but render it inadvisable. As great relief from pain usually soon follows the simpler operation, it may be assumed that complete removal of the perineural constriction relieves the irritation and possibly, in addition, diminishes the production of further intraneural sclerosis by reducing its blood-supply.

Can any treatment be actively directed to the intraneural scar after operation? Of late years therapeutic measures for the solution of scars have rapidly multiplied, and the experiences in our military hospitals will do much to teach us more precisely the indications for, and the efficacy of, the numerous forms. Recently we have adopted ionisation with normal salt solution as part of the daily routine treatment in cases of thermalgia as soon as the operation wound will permit, and so far our results have been most encouraging. It appears to rapidly relieve the milder forms of pain which tend to occur occasionally after operation, and has undoubtedly accelerated convalescence.

It is not intended in this paper to deal with the necessary support, massage, &c., of the paralysed muscles, but it is essential to emphasise the special care required to prevent arthritic adhesions in a condition which is essentially one of nerve irritation.

During the period of waiting for operation, on account of the risk of sepsis, the terrible pain is a very difficult symptom to treat. Considerable relief can generally be temporarily afforded by maintaining the limb elevated on pillows, with the hand or foot lightly wrapped in lint, which is kept moist with some evaporating lotion. Further benefit is obtained by keeping the patient free from disturbance, and, where practicable, in isolation.

Injections of cocaine or alcohol into the affected nerve have been recommended as a form of treatment. They may be used in the worst cases to relieve the pain, but their substitution for surgical procedures, which are directed against the progress of the pathological condition, is scarcely wise, since it is impossible to estimate the subsequent extent of the fibrosis and its resultant disabilities.

In conclusion, I desire to express my thanks to Captain W. R. Douglas and Captain J. Morley, who have operated on most of the cases, and to the medical officers of the Mosley-road Neurological Hospital, Mr. W. P. Stocks and Dr. A. H. Hopkinson, who have always rendered me every assistance in the investigation.

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BAYONET WOUND OF BUTTOCK; LUNG PUNCTURED; SURGICAL EMPHYSEMA.

BY JOHN D. HAYWARD, M.D. LOND.,

CAPTAIN, R.A.M.C.

THE following note concerns a case recently admitted to a hospital in France. The result of the injury presents points of anatomical, surgical, and medical interest.

Private W. H. was admitted on April 17th, 1917. He complained of no pain or inconvenience, but had been sent down from a field ambulance on account of an accidental bayonet wound.

History.—In the early morning of April 14th, 1917, this soldier was about to leave a dark dug-out to muster for an attack. He was stepping down backwards from a ledge when he ran his right buttock on to the bayonet fixed to a rifle leaning against a cross-beam. He felt no pain until the falling rifle pulled the bayonet out of the wound, and even then there was little suffering, and he hobbled off to report himself and was directed to the field ambulance. He describes the bayonet as entering some 8 inches.

Present state.—There is a small nearly healed skin wound at the upper and outer surface of the right buttock; it is not larger than a florin, and if a line be drawn from the anterior superior spine of the ilium to the top of the great trochanter the scar is situated two-thirds of the way down this line and about two inches behind it. There is no pain or tenderness about the wound or anywhere else. There has been no hæmoptysis, cough, or dyspnœa, no pain on deep inspiration. Neither by examination in the ordinary manner nor under the X-ray can fluid or air be detected in the pleural cavity, and there are no abnormal abdominal symptoms.

From the site of the wound up the right side and over the right thorax, back and front, there is marked surgical emphysema extending up to the clavicle in front and into the axilla at the side. This emphysema was plainly visible to the eye. On the X-ray screen and on a photographic plate it showed as a band ½ to 1 inch in width, light-coloured on the screen, dark on the plate, between the skin and the muscles.

In the erect position there appears such a distance from the gluteal region to the thorax that it was difficult to believe that an injury to the former—so trifling, apparently, that the sufferer hardly noticed its occurrence—could implicate the cavity of the latter. No other conclusion, however, was possible, and Lieutenant-Colonel Nathan Raw demonstrated on the cadaver that a knife 8½ inches long could be pushed up from the position in the buttock, marked in our patient, up in the muscles behind the peritoneum to pierce the diaphragm and prick the lung. In the bent crouching position, in which our patient was wounded, a couple of inches less would no doubt suffice. It is obvious how a small change of direction would endanger important blood-vessels and the abdominal contents; no doubt the bayonet was directed by

In this photograph the wound shows more plainly than in reality, as it was coloured to show its position.

the ilium in the path of less danger. The absence of symptoms and of physical signs was remarkable; indeed, but for the emphysema the injury would have appeared a trifle.

In a few days most of the subcutaneous air disappeared, but for some time a band—highly resonant to percussion and the width of the axilla—extended from the apex of the axilla down to the scar of the wound, presenting the characteristic crackling sensation to palpation, and giving a cracked-pot note in the lower axilla.

The soldier was evacuated none the worse for his curious accident.

KING EDWARD'S HOSPITAL FUND FOR LONDON.—The honorary secretaries of King Edward's Hospital Fund for London have received at the Bank of England the sum of £35,000, the contributor to the charity desiring to be acknowledged simply as "A Donor."

A NOTE ON

CERVICAL LAMINECTOMIES.

WITH AN ILLUSTRATIVE CASE.

BY R. B. BLAIR, M.B., F.R.C.S. EDIN.,

CAPTAIN, R.A.M.C.

THE number of cases of gunshot and shell wounds involving the spine which are operated on at a casualty clearing station is extremely small. Many of them, notably those with paraplegia, are often considered to be hopeless, and indeed there are, as a rule, other cases waiting attention in which operative interference would be more justifiable. In short, it is a disagreeable fact that in many cases of spinal injury operation is a useless waste of time and energy.

There are cases, however, carefully selected, in which an operation should be considered. The deciding factors may be: (1) Incomplete paralysis; (2) accessibility of the missile; (3) pain.

Incomplete paralysis or paresis determined by a thorough examination of the case in question justifies a more favourable prognosis.

Accessibility of the missile, discoverable by X ray examination, would indicate surgical interference. Pain, due to pressure on nerve roots, may be so severe as to justify an operation on humanitarian grounds alone, and a combination of all three or any two of the above reasons ought to remove all doubt from the surgeon's mind as to operation.

Radiogram localising the fragment of shell.

It may be a debatable point whether cases of spinal injury should be operated on at a clearing station or whether the operation should be delayed until the patient reaches a base hospital. It is certainly beyond question that if there is pressure on the cord by bony fragments or missile the sooner that pressure is removed the more hopeful will be the outlook. If the pressure is not relieved permanent changes will take place in the cord and the hopes of recovery become reduced to a minimum. Should a missile be lodged to delay the operation may be to invite the advent of sepsis, a very grave danger to the life of the patient from spinal meningitis or myelitis.

In a reasonably hopeful case, after due consideration of all the questions at issue, it seems that if an operation is to take place it should be performed at the clearing station. A writer has already pointed out that spinal cases travel as well after, if not better, than before operation, and cases can always be detained until fit for transit.

Before proceeding to undertake the operation it is advisable to have an X ray examination (this can be carried out at most clearing stations). Some surgeons demand a lateral in addition to an antero-posterior skiagram, but it is quite possible to obtain a satisfactory localisation with antero-posterior views and accurate measurements made in relation to bony points.

Retention of urine presents a difficulty to the surgeon demanding time and patience, and which is apt to be somewhat trying when so many cases have to be dealt with. The risks of cystitis and an ascending infection are well known, though perhaps not always fully realised. Two steps are to be considered—namely, six-hourly catheterisation and suprapubic cystotomy. Catheterisation risks may be considered overrated by some surgeons and suprapubic cystotomy believed to be too drastic, but when one appreciates the conditions that require the transference of the patient from one hospital to another, the difficulties of passing catheters on an ambulance train, it would seem wise, if not expedient, to perform a suprapubic cystotomy at the clearing station.

Thomson Walker, an authority on genito-urinary surgery, recommends the adoption of such a procedure as early as possible.

The following case of cervical laminectomy is not without interest.

The patient (M.) received a shell wound in the neck posteriorly quarter of an inch to right side of the middle line on a level with the interval between the third and fourth cervical spines. There was no exit wound. Wounded some ten hours before admission, the patient had paralysis of both upper limbs and the right leg. The upper arms were abducted from the sides, flexed at the elbows, and hands were in the supine position, with the fingers semi-flexed. All reflexes were absent in the arms and right leg. Voluntary movement was present in the left lower limb. Severe pain in both arms was complained of, especially in the region of the left shoulder. No other sensory disturbances were present. The bladder was markedly distended. There were no changes in the pupils and no recession of the eyeballs. X ray examination showed the shell fragment lying against the right lamina of the fourth cervical vertebra. It was localised by relation to bone and found to be one inch deep to the spine of the fifth cervical vertebra. The bladder was evacuated by passing a No. 8 silver catheter, a metal instrument being used because of the presence of an old stricture in front of the triangular ligament. Warm ether vapour was administered and a six-inch incision made in the middle line. Cutting down on the cervical spines, the muscles were separated on the right side between the laminæ and the spines and retracted outwards. The spines of the third, fourth, and fifth vertebræ were removed by bone-cutting forceps. A probe passed into the entrance wound formed a useful guide in the operation and the fragment was easily traced and removed. The right lamina, depressed to the extent of, roughly, a quarter of an inch, was shattered and removed by bone forceps. The dural membrane was found to be intact and little or no blood seen in its neighbourhood. After irrigating the wound cavity with eusol the wound was almost completely closed with catgut and silkworm-gut sutures, leaving a small, light eusol gauze pack in the wound and a Carrel tube. The original entrance wound was excised and a Carrel tube inserted into the track.

Two days later there was slight voluntary flexion of the toes of the right foot, followed 24 hours later by some movement in the arms and the presence of a mild knee-jerk on the right side. Six days after the operation the Carrel tubes were removed, and two days later the wound was closed by three silkworm-gut stitches. Voluntary movement improved daily, and before the patient was evacuated to the base he could raise both arms to his temples, and could flex the right knee to nearly a right angle. The relief from the excruciating pain referred to the left shoulder was rapid and gratifying.

A suprapubic cystotomy was not performed. The metal catheter was left *in situ* for three days to dilate the stricture, then six-hourly catheterisation was carried out until some control over the bladder was established.

I am now convinced that it would have been wiser to drain the bladder suprapubically in order to avoid the dangers of cystitis and to overcome the difficulties of catheterisation in the presence of a stricture.

CENTENARIANS.—The death of John Mullane, a farm labourer, of Shanagarry, Cork, is reported at the age of 108.—Miss Helen Emily Todd has died at Shirley, Southampton, in her hundredth year.

CULTURAL EXPERIMENTS WITH THE MENINGOCOCCUS.

BY H. WARREN CROWE, M.D., B.CH. OXON.,

TEMPORARY LIEUTENANT, R.A.M.C.; LATE BACTERIOLOGIST, SOUTH-WESTERN DISTRICT.

(*Report to the Medical Research Committee.*)

IN the report on cerebro-spinal fever (Plymouth district, 1915) to the Medical Research Committee which was made in conjunction with Dr. Cresswell Shearer and Dr. John Donald, I described a new medium for growing the meningococcus.[1] The experiments which form the subject of this paper were carried out in order to determine the relative value of this medium as compared to those commonly in use for identifying the meningococcus.

It was found that if a 24 hours' culture of a meningococcus grown on my medium is emulsified in distilled water, Ringer's solution or saline (either of 0·85 or of 1·5 per cent. strength) and then progressively diluted, a certain minimum number of organisms must be planted out before growth will be re-established. One can assume that the vitality of the culture is impaired, probably by the death of a proportion of the individual organisms either during the growth of the culture or during the subsequent manipulations. In favour of this view is the fact that if dilutions are carried out from a glucose-serum-broth culture, with the same medium as the diluting fluid, then on my medium growth occurs if any organisms are present in the sample planted out.

If the dilutions of a culture from a solid medium are planted out on different media it will be found that the minimum number of organisms necessary for further cultivation varies with the medium. It varies also with the medium on which the emulsified culture was grown. If my medium is used alone results are fairly constant. When a quantity of emulsion containing about 5000 organisms is planted growth always occurs, whilst 500 germs may or may not grow. I take it to be a fair method of comparison to compute the minimum number of germs necessary to re-establish growth on different media under equal conditions of experiment.

In the experiments which immediately follow the cultures were all grown on my medium.

Experiment: Chocolate[2] *Medium* versus *Serum-trypagar* (*the Original Official War Office Medium*).

A 24 hours culture of a freely growing meningococcus (strain P. isolated 10 weeks previously) was made into a homogeneous emulsion in distilled water of a strength of not less than 10,000 millions to the c.c. Of this emulsion 5 c.mm. was transferred to 50 c.mm. of distilled water and well mixed. This process was repeated eight times, flaming the pipette between each dilution. Then starting with the weakest dilution, 5 c.mm. of each was planted on to a plate of my medium and also on to a freshly-prepared plate of serum-trypagar. In addition 10 c.mm. containing not less than 100 millions (from the original emulsion) was planted on serum-trypagar. After 48 hours the plates were photographed (see figures). Table I. gives the result. It will be noted that the actual dilutions were by 11 not by 10, the figure used to get round numbers. The error diminishes the difference between the two media. The last three dilutions are omitted, being negative. Contaminating organisms did not appear on any of the plates.

TABLE I.

Dilution.	5 c.mm. containing about—	Growth on chocolate medium.	Growth on serum-trypagar.
I. Original emulsion...	100 millions.		+
	50 ,,	+	+
II.	5 ,,	+	—
III.	500,000	+	—
IV.	50,000	+	—
V.	5,000	+	—
VI.	500	—	—

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 1.—Photograph of growth on chocolate from the original emulsion, marked 1, and the first two dilutions marked 2 and 3.
FIG. 2.—Growth appears on the next two dilutions, but not on 6.
FIG. 3.—Photograph of a serum-trypagar plate. On the left-hand side a very slight growth is seen from about fifty million organisms. The corresponding growth on chocolate is that marked 1, on Fig. 1. On the right-hand side of the plate is a more profuse growth from a double amount (10 c.mm. of original emulsion).

Here where 5,000,000 germs failed to grow on serum trypagar, 5000 gave several colonies on chocolate medium.

The next Table (II.) gives the result of another experiment, in which a number of different media were tested exactly on the same lines. The strain used was a different one (Pr.).

TABLE II.

Medium.	Approximate number of organisms planted.					
	100 mill.	10 mill.	1 mill.	100,000	10,000	1,000
Buchanan	—	—	—	—	—	—
Ascitic legumin agar	+	+	—	—	—	—
Amino-acid agar (Cole)	—	—	—	—	—	—
Amino-acid agar plus fresh blood	+	+	—	—	—	—
Blood agar	+	+	—	—	—	—
Blood-smeared agar	+	+	—	—	—	—
Egg medium	—	—	—	—	—	—
Chocolate medium	+	+	*	*	+	+

* The plate carrying these two dilutions was spoilt.

The foregoing experiments are examples of a large number carried out under differing conditions and with different strains of meningococci. It was found that using chocolate medium as the original culture medium the number of organisms necessary to re-establish growth varied, yet on the whole the relative value of the different media remained the same.

[1] The substance of this report was published in THE LANCET, Nov. 20th, 1915.

[2] A familiar name to avoid a cumbrous descriptive title. It will be remembered that the medium in question is made up of three parts of defibrinated bullock's blood with trypsin agar and 1 per cent. glucose, and is cooked until it becomes a glossy opaque solid medium of a rich chocolate colour.

Taking 1000 germs to be a rough average of the number which must be planted on chocolate medium before growth will ensue, then for other media the numbers will be as follows:—

Amino-acid agar to which accessory food bodies extracted from blood have been added (Miss Jordan Lloyd)	100,000.
Ascitic legumin agar Amino-acid agar and fresh blood Blood agar Blood-smeared agar	10,000,000.
Serum trypagar	50,000,000.
Buchanan's medium Amino-acid agar Egg medium	More than 100,000,000.

Since these experiments were carried out the official War Office medium has been changed from serum-trypagar to hæmoglobin trypagar. Dr. Cresswell Shearer has kindly performed for me similar experiments with the new medium, since I was not in a position to undertake them myself.

Experiment: Chocolate Medium versus *Hæmoglobin-trypagar, as provided by the Central C.S.F. Laboratory, Millbank.*

This experiment was carried out in identical fashion with those already described. From a young culture on chocolate medium an emulsion of about 5000 million meningococci to the cubic centimetre was prepared, diluted 1 in 10 through five dilutions in distilled water and 5 c.mm. planted out from each dilution on to the two media. The result is shown in Table III.:—

TABLE III.

Dilution.	5 c.mm. containing about—	Growth on chocolate medium.	Growth on Hb trypagar.
I. Original emulsion	25 millions	+	—
II.	2½ ,,	+	—
III.	250,000	+	—
IV.	25,000	+	—
V.	2,500	+	—
VI.	250	+	—

This experiment was repeated several times with the same result.

Dr. Shearer then tried performing the experiment with a young culture on trypagar. He found that planting out 15 millions (contained as before in 5 c.mm.) no growth of any kind occurred on either media. Eventually, however, after repeated attempts he found that if the emulsions were made up in, and diluted by, Ringer's solution growth could be obtained from about 15 millions, from 1½ millions, and from 150,000 on chocolate medium—i.e., from the original emulsion of 3000 millions and the first two dilutions. In none of these experiments was any growth obtained on hæmoglobin-trypagar. It seems that trypagar does not keep the meningococcus alive at all well, and either the vitality of the whole culture is very low and the individuals succumb very rapidly in distilled water or most of the organisms are dead. Possibly only those in actual contact with the surface of the medium are at all capable of further growth.

These experiments show quite clearly the extraordinary superiority of chocolate media over any of those examined for resuscitating the meningococcus under laboratory conditions, but I by no means claim such a superiority for my medium in the practical work of searching for carriers. In point of fact I understand from Dr. Shearer that the results from a parallel series of swabs planted on chocolate medium and on hæmoglobin-trypagar were practically identical. In general one would expect organisms just removed from favourable surroundings such as obtain for the meningococcus in the nasopharynx to have a greater vitality, though at the same time to be more fastidious in their requirements, and it may be that for this reason some enrichment has to be added to the primary culture medium. In the case of the meningococcus more particularly, Dr. Shearer and I have shown that a trace of nasal mucus (or its extract in distilled water) exercises a most powerful stimulating effect on growth.[3] It is probably this factor which explains the contrast between practical experience in culturing swabs and the inferences which one might be tempted to draw from the experiments above described.

[3] Ibid., and see also a forthcoming papsr by Shearer.

Reviews and Notices of Books.

Localisation et Extraction des Projectiles. By L. OMBREDANNE et R. LEDOUX-LEBARD. Paris: Masson et Cie. 1917. Pp. 348. Price 4 francs.

THIS is a very complete treatise on the localisation and extraction of bullets and other missiles, and embodies the best practice of the French school, having therefore a very special interest for all surgeons and radiologists. The subject has been treated in all its aspects, and the work is illustrated with numerous illustrations and diagrams, so that the authors' meaning is never in the least doubt. Principles are clearly explained, apparatus fully described, and methods depicted in the most clear manner. The dangers of the X rays are thoroughly insisted upon and directions given for the safety of both operator and patient. Many of the devices for accurate localisation in special parts of the body are most ingenious, and while apparently complicated in some instances they will be found expeditious in practised hands. This book will be studied with pleasure and profit by all those whose duties call them to the class of work dealt with.

A Manual of Practical X Ray Work. By DAVID ARTHUR, M.D. Glasg., D.P.H. Camb., and JOHN MUIR, B.Sc. M.B. Glasg., &c., Captain, R.A.M.C. London: William Heinemann. 1917. Pp. 351. Price 12*s.* 6*d.* net.

THE war has been productive of much literature of which radiology forms the whole or at least an important part. New books have been written and older ones have been given a new lease of life. The volume under consideration is in the latter category, and we may say that it comes forth with renewed vigour after its period of quiescence. The influence of the war is manifest all through the present edition, and its value is materially enhanced in every department. If we might venture to make any criticism it would be that too much space has been given up to a description of various forms of apparatus and the technical side of the subject generally, and too little to the medical aspects of radiology. A whole chapter has been given up to orthodiagraphy, the practice of which has almost ceased, while the subject of the investigation of disorders of the digestive system is dismissed in a very few pages, though it is a very important part of the radiologist's daily work. Some of the illustrations reproducing radiograms are rather weak, but there are difficulties at the present time in connexion with process work which should be allowed for. In the chapter on X ray Therapeutics there is a most excellent description of the technique for producing epilation.

JOURNALS.

Archives de Médecine et de Pharmacie Militaires. Tome LXVII. No. 2. February, 1917. Paris: L. Fournier.—In a second article on Fractures due to Projectiles, with Special Reference to the Displacements of the Bones, M. Ed. Delorme, Médecin Inspecteur-Général, Membre de l'Académie de Médecine, describes and illustrates by drawings taken from radiographic plates injuries of this character affecting the lower extremity, beginning with the bones of the foot and concluding with those of the hip. He shows that the lesions are typical of those obtained in experimental pathological anatomy and can be referred to either as fractures by contact, abrasions, grooves, gutters, and perforations with splinters or comminuted fragments. In contrast with the fractures which take place in civil practice, where the forces which bring about the lesions of the bones continue to act on the fragments and lead to their deviations and even displacements to a considerable distance from the site of fracture, the fractures in warfare are frequently limited to the portion of the bone struck by the projectile, whilst the ligaments and periosteum serve not only to maintain the fragments *in situ*, but also to assure their nutrition, since the blood-vessels run through them. In the foot, fractures of the astragalus and calcaneum are complicated in civil practice with luxations difficult, if not impossible, to reduce except by operation, which is

rarely called for in military surgery, for here the bones themselves are scarcely displaced, but fragments only may be more or less driven away by the projectile. Conservative surgery should play a large part in the lesions of the foot, and care should be taken that, if stiffness or ankylosis supervene eventually, the foot be maintained in a position at a right angle, and not at an obtuse angle, to the leg. The formation of callus may be voluminous in the first metatarsal bone with central necrosis, or even osteomyelitis and marked swelling; both these processes are rare in the other four metatarsals. Pseudo-arthroses are fairly frequent in lesions of the tibia and accompany those with loss of substance; they occur, too, in fractures of the fibula; but osteomyelitis is rare in these bones, and there is no justification for the extensive excisions formerly practised in certain hospitals. The formation of callus is not excessive in the leg, but synostosis occurs not infrequently when both bones are fractured. In lesions about the region of the knee it is important to remember that these are limited and localised when they correspond solely to the epiphysis, but that they extend towards the diaphysis when the projectile strikes the femur above the base of the condyles. Many excisions and resections would be avoided if purely epiphysial lesions were not confused with epiphyso-diaphysial lesions, and thus important portions of the bone would be saved, to the great advantage of the patient's subsequent welfare. Fibrous or osseous ankylosis is far too frequent in lesions about the knee-joint and demands care and attention from the surgeon for its prevention; regular and even pressure by means of dressings on the joint should be adopted after adhesions have been broken down so as to prevent effusion from re-forming therein. In fractures of the femur M. Delorme has always urged that these important cases should be treated in the hospitals near the front, if possible, so as to avoid any increase in the displacement of the fragments during transportation of the wounded man, owing to their natural internal splints—the large splinters about the ends of the fracture—being shaken free from their connexions with the periosteum. Care is needed to correct displacements and to bring about the alignment of the femur by compression of dressings from without inwards, and by abduction of the limb when the upper fragment is carried outwards by the action of the muscles. When the surgical neck of the femur is perforated by the projectile the fissures radiating therefrom tend to follow the direction of the axial osseous fibres, and in these cases solution of continuity is not met with as often as in civil practice, where there is often displacement owing to oblique or transverse separation of the neck. Pseudo-arthroses are rare as a result of lesions about the hip-joint, but the tendency to osseous union, either limited to the articulation or prolonged by osteophytes to the iliac fossa or ischium, is shown by drawings from radiographic plates. M. Delorme is of opinion that, while radiography has been too exclusively reserved for the search of foreign bodies, it has not been sufficiently utilised in the case of fractures to control the correction of displacements, to ascertain the processes of repair, and the position of the bony splinters caused by the action of the projectile.

The Indian Journal of Medical Research. Vol. IV., No. 4.—This number of the Journal contains 15 separate contributions, of which four are supplied by Major E. D. W. Greig, I.M.S., whose first paper gives the result of the bacteriological examination of the stools of 659 cases of cholera at Calcutta. He made an extensive serological study of the cholera-like vibrios found in the stools of these cases; he believes that the organisms can be grouped, and that one group includes the majority of the strains. In his second contribution he continues his study of cholera-like vibrios found in the Calcutta cases, and he discusses the results of his investigations on the strains of atypical vibrios. His feeding experiments on rabbits add support to the view that cholera-like vibrios play a part in the production of the disease. Major Greig's third paper is a note on the appearance of malignant tertian rings in the blood during intravenous injections of tartar emetic. It is arguable, he thinks, that the intravenous method of administering tartar emetic would be found in practice to be generally applicable on a large scale, as would be required in the prevention of malaria. His fourth contribution deals with the "sprouting capacity" of grains issued as rations to troops. The experiments of Axel Holst and other Norwegian experts have shown that the anti-scorbutic value of grains can be markedly increased by allowing them to sprout. Major Greig says that the process of crushing lentils destroys to a considerable extent their capacity for sprouting, but does not deprive them entirely of their power. Hence, for the prevention of scurvy the uncrushed grain is to be preferred, as it gives the maximum yield in regard to sprouting and therefore of anti-scorbutic vitamines. Crushed grains tend to decompose much earlier in the process of sprouting than do uncrushed grains, and this is a point of considerable importance. The sprouting of lentils has great practical advantages, as it enables the anti-scorbutic vitamines to be manufactured immediately prior to consumption. These vitamines are extremely fragile and sensitive, being completely destroyed by drying.—Dr. M. B. Soparkar deals with the vitality of the tubercle bacillus outside the body. In order to gain evidence whether dried tuberculous sputum in the form of dust can remain alive and virulent, this investigator carried out a number of experiments. He found that the tubercle bacilli when exposed to direct sunlight were alive for 6 hours, but dead after 8 hours: when exposed to diffused daylight they were found alive for 6 days, but were dead after 8 days. When sputum was kept in darkness, even when completely desiccated, the tubercle bacilli were found alive and virulent for 309 days. From decomposing sputum living tubercle bacilli could be isolated after 20 days, but not after 26 days. Bovine tubercle bacilli were more resistant to sunlight than human bacilli, and when exposed to electric light the former were found alive for 74 days but dead after 100 days.—Lieutenant-Colonel J. W. Cornwall, I.M.S., continues his interesting studies of kala-azar, on this occasion in collaboration with Assistant Surgeon T. Kesava Menon. They found experimentally that the destruction of *L. donovani* and *L. tropica* in cultures is primarily due to exhaustion of the available nutriment and not to the direct action of the products of bacterial metabolism. On rare occasions living flagellates of *L. donovani* may be found in the intestine and rectum of artificially infected bugs (*Cimex*), and large numbers of living Lygeid herpetomonads will pass into the intestine and rectum of the artificially infected *Cimex*. Experiments also suggest that the transmission of bacterial infections in nature by bugs, in the act of biting, is probably of rare occurrence. Attempts to procure regurgitation of *L. donovani* flagellates by infected bugs again had negative results. A second contribution is furnished by these two experts on experimental immunisation against rabies by the method of Phisalix. They obtained no experimental evidence that rabbits can be immunised against rabies by a mixture of the cutaneous secretion of certain Indian frogs with the heated venom of *Daboia russelli*, a fairly common Indian viper. The uniformly unsuccessful results of the experiments do not encourage the authors to believe that success might follow if other combinations were tried.—Dr. Sudhamoy Ghosh supplies a report of a chemical investigation regarding chaulmoogra oil in connexion with its use in the treatment of leprosy.—A joint paper is contributed by Lieutenant-Colonel W. D. Sutherland, I.M.S., and Assistant Surgeon G. C. Mitra on Hæmolysis by Sodium Oleate and Sodium Gynocardate, giving the results of a large number of experiments.—Mr. S. K. Sen, Assistant Imperial Pathological Entomologist, gives a preliminary note on the Rôle of Blood in Ovulation in *Culicidæ*. His investigations with *Stegomyia scutellaris* lead him to conclude that the deposition of eggs is possible without a meal of blood; an initial meal of blood may sometimes suffice for as many as three batches of eggs, and a single fertilisation suffices for several batches of eggs.—Lieutenant-Colonel Clayton Lane, I.M.S., continues his valuable studies of intestinal parasites, and his present contribution relates to *Gireterakis girardi* and other suckered nematodes, illustrated by seven plates.—The prevalence of ankylostomiasis in the Madras Presidency is dealt with by Dr. K. S. Mhaskar, and to this paper we have already drawn our readers' attention in THE LANCET of July 21st.—Temporary Lieutenant R. L. Mackenzie Wallis, R.A.M.C. (chemical pathologist, St. Bartholomew's Hospital), supplies three papers—namely: (1) on Improvements in Bacteriological Media; (2) a New Test for Chlorine in Drinking Water and its Application for the Estimation of the Chlorine Present; and (3) the Use of Aromatic Chloramine Compounds for Sterilisation of Water for Drinking Purposes.—This number completes the fourth volume of the Journal. An index of authors and one of subjects is annexed.

New Inventions.

HOLLOW PEGS.

THE accompanying photographs show hollow pegs used by the limbless soldiers at the Pavilion Military Hospital, Brighton. They are made of the fibre-board of which light handbags and portmanteaux are made. The one for a below-knee amputation weighs 19 ounces, and the one for a thigh amputation weighs 2 lb. 4½ oz. The cost of material used in the smaller one is 2*s*. 7½*d*., and of the larger 4*s*. The below-the-knee peg is so light that it can be put on as a slipper may be put on, and used without being fixed by the tapes. Though it is light and inexpensive it is very tough and strong, and patients have walked many miles on it. Being hollow, these pegs may be used before complete healing has taken place, and certainly long before the stump has shrunk sufficiently to justify the fitting of a permanent limb. Their use helps the shrinking during the waiting period and hardens the skin over the "bearing" points in preparation for the permanent limb. Patients who have worn this hollow peg have "walked right away" without any training, when their new limb has been made. After the permanent limb is in use these hollow pegs are useful in the home when the heavy permanent limb is put off; or at night, or at other times, when a man must rise from his bed. A well-fitting one is no more difficult to apply than a slipper, and takes no longer time. It would probably be advisable to fit men with these hollow pegs as soon as healing is complete and to send them on furlough for several months before fitting them with permanent limbs, in order to avoid the disappointment and waste that come from applying limbs before complete shrinking has taken place.

These pegs, applied early, often find out a weak spot in a stump and lead to its prompter remedy. If a spot is going to break down on pressure or on skin or scar tension, or if a bulbous nerve is going to develop or small sequestrum appear, it is better that this should be made manifest before an expensive limb has been made. Men are more useful on these pegs than upon crutches. "Crutch paralysis" is avoided, and men have their hands free and can more easily take to light duties and training.

The man in the photograph with both legs off walks quickly and admirably on his pegs with the aid of one stick.

W. A. CHAPPLE, M.D., Ch.B., M.R.C.S., D.P.H.,
Brighton. Major, R.A.M.C.

FIG. 1.

Patient wearing two hollow pegs.

FIG. 2.

Showing the double amputation for which the pegs were worn.

METROPOLITAN HOSPITAL SUNDAY FUND.—Sir Ernest Tritton, presiding at a Council meeting of this Fund at the London Mansion House on August 8th, said that the collection this year had been a very successful one, the total sum available for distribution at the present moment being £70,061 16*s*. 6*d*. This was the biggest distribution that the Fund had ever made with the exception of that for the year 1905, when a large legacy was added. The large collection was a proof that the people of London had confidence in the Fund and in the work that the hospitals were doing for the sick poor and for the men who were fighting so bravely for us. Sir William Church, in moving the approval of the report of the committee of distribution, pointed out that the sum mentioned by the chairman did not represent the total for the year, and that by Oct. 1st the present total might be considerably augmented. Prebendary Ingram seconded the motion, which was unanimously carried. The report stated that this year 241 institutions had applied to participate in the Fund, being seven less than in 1916. Seven and a half per cent. of the total sum available for distribution is appropriated to the purchase of surgical appliances during the ensuing year, and 2½ per cent. for district nursing associations. Among the recipients receiving large awards are: the London Hospital, £8070 5*s*. 10*d*.; the Middlesex Hospital and Convalescent Home, £3210 13*s*. 9*d*.; St. George's Hospital, £2615 7*s*. 1*d*.; St. Mary's Hospital, £2230 10*s*. 10*d*. Guy's and King's College Hospitals also receive sums of over £2000.

THE LANCET.

LONDON: SATURDAY, AUGUST 11, 1917.

Our Daily Bread.

THE petition for our daily bread has been to most of us until recently a formal affair and is only now becoming a matter of interest, if not anxiety. Concern about the quality of our bread has been largely allayed by such work as Professor J. M. BEATTIE records in another column. But the question of quantity remains acute, and in his pamphlet on the national food supply in peace and war, which has just been published by the Cambridge University Press, Professor T. B. WOOD gives the arguments which should enable us to face the situation with confidence. Professor WOOD covers ground well-known to most of our readers and bases his conclusions on familiar assumptions, but his presentation of the subject is worthy of notice by reason of its extreme lucidity and absence of tiresome detail, while coming with the authority of the Food (War) Committee of the Royal Society, of which he is a member. He assumes the daily food requirement of the average man to be 3400 calories and finds that before the war 4000 calories were available for him, of which he could therefore waste 15 per cent. without detriment, a not excessive allowance for the loss on distribution. This margin having already been somewhat reduced, Professor WOOD is confident that any considerable decrease in consumption below the stated standard cannot fail to produce a decrease in national working efficiency, and therefore in the output of munitions and of farm produce. He greatly simplifies the consideration of the food required by dealing only with calories and not with protein, justifying this simplification by saying that the man who eats enough food to provide the calories necessary for the work he has to do must exercise considerable ingenuity if he is to avoid eating enough protein. He further simplifies his problem by regarding food principally as bread, since bread is not only the cheapest form of food, but is also the largest item—nearly 40 per cent.—in the national food budget, especially of that part of the population engaged in productive work. For practical purposes he takes a pound of flour a day for the average man as the convenient unit of his calculations.

Before the war four-fifths of the cereals used in this country were imported from abroad, and our bread supply can obviously be extended both by importing a greater quantity of wheat and by growing a greater area of wheat at home. At the moment practical difficulties beset both of these alternatives, but a third suggests itself at once on the showing that of 17 million tons of cereals consumed each year, only some 5 million tons are used directly as human food. It should be possible, then, to divert from animals and industry to human consumption some part of the amount at present claimed by them—to cease, in fact, taking the children's bread and giving it to the dogs. Much of this saving would be pure gain and could be effected without compensating loss. Idle horses require no oats, and half a million tons might, Professor WOOD estimates, be rescued for human consumption. It is careless to waste freightage in importing maize for consumption by pigs, when the finished product in bacon or ham, at only a tithe the gross weight, could equally well be imported. But even where the cereals consumed are returned to man later in another form the claim of the animal as a profitable middleman must be carefully reviewed. In this respect the cow is specially commended, as she not merely produces 1 pound of dry human food in the form of milk for every 12 pounds of dry food consumed, but her diet consists chiefly of grass, hay, and roots which are not directly suitable for human food. The pig, whilst equally good as a converter, requires meal made from grain which man can use without conversion; and the production of beef is a most wasteful process requiring proportionately five times the amount of fodder to produce that milk does. Such are some of the considerations which indicate that economies are possible which would set free in one year 4 million tons of cereals for our daily bread.

The methods for carrying out the policy indicated are clearly set forth by Professor WOOD, who recognises at the outset that we must take full advantage of the experience of our enemies in this direction. It is a matter of common knowledge that quite early in the war Germany laid down plans on an extensive scale to limit the consumption of cereal foods by animals, but the result was a lamentable failure. Professor WOOD quotes the caustic summary of the result made by a speaker in the Reichstag. "The first stage," he said, "was for the State to declare that it would take over all crops. The second stage was the setting up of a Committee of Control. The third stage was the appointment by the Committee of a vast army of officials. The fourth and final stage was the disappearance from the market of the commodity in question." This failure was due briefly, in Professor WOOD'S words, to the paralysis of the normal channels of distribution by the fixing of prices and to the want of foresight that a fixed price for any one commodity would turn the farmer's efforts towards the production of another commodity whose price was left free. Any policy to secure in this country the maximum amount of food for human consumption must be simple in practice, avoiding dislocation of the channels of distribution, and involving a system of price-fixing which shall remove temptation from the farmer to cultivate more remunerative but dispensable products. The appearance of Professor WOOD'S pamphlet will assist to create a body of opinion able to appreciate the importance of the orders issued by the Food Ministry.

Wounds of the Knee-joint.

WOUNDS of the knee-joint of all sorts, but especially ragged destructive injuries due to bullets or shells, are of great importance, for if not effectually treated they are likely to lead to loss of the limb, or even to the loss of life itself. Any advance in our treatment of these injuries is worthy of our most careful study. The great extent of the knee-joint and its many ramifications are responsible for the risk of sepsis, and when septic organisms enter there is almost certain to be a great deficiency in the drainage; the pus which is formed is unable to escape freely from the cavity, so that the natural attempts at repair are frustrated and absorption of the septic products and of the germs themselves occurs. What, then, can be done? How must the surgeon act so that he may minimise as far as possible the risks from these septic wounds of the knee-joint? The war has furnished a deplorable number of this form of injury, and in many cases the results have been tragic, but the accumulating experience of three years is furnishing us with clearer indications of the methods to be pursued.

In our present issue is an article by Captain J. CAMPBELL, R.A.M.C., and Major H. F. WOOLFENDEN, R.A.M.C., in which they give full details of the treatment which they have found to be of the greatest value. Their work covers a period of about two years in a base hospital in France, and the number of cases on which their conclusions are founded is sufficiently great to make them trustworthy. Fortunately, since the date of their report, as Sir GEORGE MAKINS points out in a note to the paper in question, the supply of such cases at a base hospital has been sensibly diminished by the more radical treatment now prevailing at the casualty clearing station. Here, as elsewhere, prophylaxis is better than treatment. The aim of treatment in all but the very mildest cases is to obtain complete obliteration of the joint ending in bony ankylosis. The first essential in the treatment of septic infection of the knee-joint is drainage, and the usual incisions on each side of the patella are utterly inadequate to prevent accumulations, for the pus would have to ascend against gravity to escape from the joint, even though the lateral incisions have been large. The authors have employed several methods, but they find that the most effectual way of draining the joint is to make posterior incisions, thereby confirming the value of the method described in THE LANCET by Major NOVIS.[1] Captain CAMPBELL and Major WOOLFENDEN are entirely opposed to the use of rubber drainage-tubes in the joint, holding that the drainage-tubes maintain the sepsis and interfere with the closure of the joint; and they view with equal disfavour washing out the cavity, for this procedure also delays or prevents the obliteration of the synovial cavity.

The principles of treatment relied upon are simple. The authors put first the complete fixation of the joint, and this is attained by the use of a Thomas's knee-splint, with fixed extension. The thigh and calf are supported in the splint by sheets of perforated zinc. When these supports are once applied they are never removed if possible, even when an operation has to be performed, and in order that no further infection of the joint should occur it is recommended that one surgeon only should deal with the cases and do all the dressings himself. The Carrel treatment is employed, the tubes being carried into the innermost recesses of the joint, the wound is dressed with gauze moistened with the hypochlorous solution, and two or three drachms of the solution are injected down each tube at intervals of two hours day and night with perfect regularity. When this method of treatment was efficiently carried out the infection was effectually countered: even from the deeper parts of the wound the invading organisms and their products were washed outwards, and no further infection of the joint from without could occur. From the records of Captain CAMPBELL and Major WOOLFENDEN it appears that the amount of pus under their technique is very small, and that adhesions form quickly between the bones leading to the obliteration of the joint cavity. Further, it adds greatly to the comfort of the patient that it is unnecessary to dress the case more than once in the 24 hours.

[1] THE LANCET, July 7th, 1917, p. 12.

Housing After the War.

THE President of the Local Government Board has sent out a circular to town councils, metropolitan borough councils, and district councils in connexion with the provision of houses for the working classes at the conclusion of the war. The matter of housing has occupied the attention of several of Mr. HAYES FISHER'S ablest predecessors, from whom active measures were expected; it is satisfactory to note that at length one of the most important and, at the same time, most difficult of the problems connected with public health legislation is to be seriously faced and dealt with as soon as circumstances may permit.

Arrears in the construction of working-class dwellings are accumulating owing to the existing shortage of labour, and the official circular seeks to pave the way for the commencement of operations with the least possible delay by ascertaining approximately and beforehand what demands will have to be met when action becomes practicable. It is recognised by the Local Government Board that private enterprise will prove unequal to the occasion, and that local authorities, if entrusted with the task, will require subsidy from public funds. For this reason a series of questions accompanies the circular, to be answered not later than Oct. 15th—a comparatively near date justified by the urgency of the matter at issue. But individual generosity among citizens or communities is not left unstimulated by the official circular of the Local Government Board, for in order that State effort may be supplemented attention is called to the importance of securing the coöperation of private enterprise, including that of public utility societies, while some of the questions are directed towards ascertaining how far in any particular locality the

inhabitants can be relied upon to help themselves. Such matters as these can only be the subject of estimate, though prophecy, based upon expert knowledge and experience, will go far to direct accurate answers. A question of similar character seeks to ascertain not only the increase or decrease of the local population due to the war, but also the probability of any such altered condition being permanent. A final question refers to the desire of the Board for general observations, including information as to the adequacy of existing accommodation, a question the reply to which may be regarded as involving, to some extent, the expression of expert opinion. The majority of the inquiries, however, relate to matters of fact. The Board asks for the number of existing houses of specified rateable values, and of those standing vacant which are suitable for the working classes and reasonably fit for habitation. Definite information is requested as to the prevalence of overcrowding—i.e., of more than two persons inhabiting one room—as to any housing schemes already prepared or contemplated by the local authority, and as to the possibility of acquiring suitable sites by agreement. Inquiry is made as to powers which the local authority may deem necessary for the acquisition of land, in addition to those already given by law, and as to the sufficiency of existing facilities for locomotion.

The Local Government Board has, in short, propounded questions which can be answered with a fair degree of accuracy by a local authority genuinely anxious to coöperate with it, and all medical men, knowing how the housing question lies at the very root of sanitary reform, will be glad to see the way in which the matter is being approached officially. Local authorities should feel assured that their aid is being asked for in a cause intimately associated with the future prosperity of the nation, as well as of the particular section of the public entrusted to their care. In unparalleled circumstances the task is set to all, and in the interests of all, of repairing the wastage of war, by securing to the survivors of the present generation, and to their descendants, more agreeable as well as healthier and more sanitary conditions of life than have hitherto been in any way universal.

MEDICO-PSYCHOLOGICAL ASSOCIATION OF GREAT BRITAIN AND IRELAND.—The seventy-sixth annual meeting of the Association was held on July 25th in the rooms of the Medical Society of London, under the presidency of Lieutenant-Colonel David G. Thomson, R.A.M.C. Dr. John Mayne Colles, LL.D., K.C., J.P., Registrar in Lunacy in Ireland, and Dr. Alexander Reid Urquhart (since deceased), late physician-superintendent, James Murray's Royal Asylum, Perth, were elected honorary members. The meeting also approved the regulations and syllabus for candidates for a certificate for nursing and attending the mentally defective. The Gaskell prize, consisting of 50 guineas and a gold medal, was awarded to Major James Cowan Woods, R.A.M.C., of The Priory, Roehampton. The work next in order of merit, that of Dr. Monrad Krohn, was considered to be of high merit, and it was decided to present him with 15 guineas and a replica of the medal in silver. Dr. C. A. Mercier read a paper entitled "Madness and Unsoundness of Mind," which led to a brisk debate.

Annotations.

"Ne quid nimis."

BIRTH CONTROL.

IF we may believe correspondence which reaches us, the use of contraceptives is gaining in vogue: their virtues are advertised quite freely, though indirectly, with the result that our young men and young women are gaining a familiarity with their use. We find it difficult to believe that ignorance is a principal agent in preventing the use of pessaries and condoms, for in large towns such things are exhibited freely in shop windows, and married folk of higher social standard are regularly circularised by vendors after the arrival of their first-born, with the result that most adults must be aware that measures against conception can be taken. But many also know that the pessary and the condom do not offer safe facilities for a kind of superior prostitution within the precincts of the moral code. They are notoriously unable to ensure against venereal infection; they are equally impotent to deal with any certainty with the virile spermatozoon. The measures to be effective have to be applied with constant care and patient exactitude; any lapse renders them entirely ineffective, and it is the persons whose training fits them for such punctiliousness who refuse to have anything at all to do with measures of prevention, while those who resort to them rarely have the qualities likely to make them efficient. Precisely the same applies here as in similar appliances to avoid venereal disease. Moreover, the assumed success of birth control among well-to-do people rests upon slender foundation, and the diminishing birth-rate, which is beginning to descend the social scale, may well have quite other than such a material explanation. In an acute study of the whole problem in the *Medical Times* for July by Dr. R. W. Wilcox, President of the American College of Physicians, the author lays stress on the broader view of life among the cultivated classes which finds enjoyment in the appreciation of art, science, literature, and the social amenities, and hence has less need for the gratification of the appetites connected with physical existence. As the intellectual stimulus begins to reach the less wealthy classes the birth-rate will similarly diminish. The moral which we may draw from Dr. Wilcox's study, even if he does not draw it himself, is that what he calls "birth control and that sort of thing" may well be left alone. He is a kind of modern Gamaliel, assuring us that if "that sort of thing" is at variance with the laws of nature and morality it will come to naught, and therefore we may let well alone. Dr. Wilcox contributes materially in two directions to our knowledge of the subject. He states that the birth-rate is essentially determined by the working of an economic law to the effect that prolificity varies in direct ratio to the productive value of the child. If the school period is prolonged, or child labour is limited, or the cost of sustenance is increased, the productive value of the child is diminished and the birth-rate falls. This, he states, has been an observed fact for generations. Two at least of these factors are present in our own generation to reduce the birth-rate among the manual workers, and it may therefore be unnecessary to assume

the existence and efficacy of extensive birth control as a dominating factor. Dr. Wilcox relieves the discussion of a distasteful subject by a delightful analysis of the birth-control propagandist. He finds him in general a sufferer from mental strabismus, accentuated by intensive cultivation, essentially an egotist who, if he recovers from an attack of one propaganda, becomes, as a rule, afflicted in rapid sequence with other attacks of a like nature. This particular propaganda has furnished to Dr. Wilcox an opportunity of an interesting psychological survey.

PARLIAMENTARY REPRESENTATION OF THE UNIVERSITIES OF EDINBURGH AND ST. ANDREWS.

WE published last week in our advertisement columns the address of Sir W. Watson Cheyne to the electors of Edinburgh and St. Andrews Universities, where a representative committee has invited him to become their Parliamentary candidate. Sir Watson Cheyne is a graduate of the University of Edinburgh, although his life work has mainly been done from London as a centre; and we feel certain that, if he is elected, Parliament will obtain from him no partisan support of Scottish or English interests, but the solid counsel of a man who has arrived at the head of the profession of all others that has the public welfare most clearly at heart. The good doctor thinks always of the public first, and it is rather a reflection upon modern society, in this country at any rate, that the calling of medicine has suffered for its altruism in not obtaining the public support which enlightened opinion should give it. Sir Watson Cheyne's long and distinguished career as a surgeon ensures that the scientific interests of medicine will always be present to his mind. It is fitting that two ancient Scottish Universities from which so many distinguished members of the medical profession have graduated should be represented in Parliament by a distinguished surgeon.

RAT-BORNE FEVER.

THE febrile condition occasionally following the bite of the rat, to which our Paris correspondent alluded last week, is of special interest at the present time, when the rat is a constant companion of the man in the trenches. Dr. T. J. Horder, in the *Quarterly Journal of Medicine* for January, 1910, described three cases of irregular periodic fever following the bite of a rat, and to these Dr. G. S. Middleton added a fourth in THE LANCET of June 11th, 1910. In a brief note on rat-bite fever in the "Medical Annual" for 1913 Dr. F. J. Charteris describes the characteristic sudden attack of fever repeated at intervals of a few days, each attack being ushered in by a rigor. He states that in a number of cases salvarsan was used and cut short the disease. Dr. Herbert French, in a later number of the Annual, also calls attention to the periodicity of the febrile attack, which recalled to him some of the characters of relapsing fever. We shall hardly be wrong in assuming that rat-bite fever is in fact due to an infecting organism, although as yet no one has succeeded in isolating it. We should like, however, to suggest that the type of temperature chart in all the cases we have cited of this fever is curiously reminiscent of the charts of trench fever given by Major Arthur F. Hurst, R.A.M.C., in THE LANCET of Oct. 14th, 1916, and of the charts of the Volhynian fever, described as occurring in the German trenches, especially on the Russian side, of which we gave examples in THE LANCET of March 3rd. No one, as far as we know, has claimed that trench fever is due to the direct bite of the rat, but the opinion is gaining ground that it is a spirochætal disease conveyed indirectly by a parasite from animal to man, and that the rat is the animal to blame. Rat-bite fever and trench fever may differ only in the presence in one case of an intermediate host. There should be opportunity in the trenches for a comparative study of the two fevers.

CREW ACCOMMODATION IN STANDARD SHIPS.

SHIPOWNERS, while naturally careful about the accommodation of their passengers, are in the habit of giving their men the minimum of sanitary accommodation, as we have pointed out on many occasions in these columns. It is therefore the more satisfactory to note the improved quality of accommodation which is being provided in the standard ships under the direction of the Controller of Auxiliary Shipping. In these ships the crews are berthed in the poop, instead of as heretofore in the forecastle, with special arrangements for steam heating. The floor and cubic space now provided are considerably in excess of the Board of Trade requirements. The messing arrangements for firemen and seamen are separate from the sleeping accommodation, and a smoke room is being provided for the general use of the men. Separate cubicles or rooms are provided, each fitted with two berths and a folding table, and situated along the side of the vessel. The firemen's and seamen's washplaces are fitted with lockers for dirty clothes, one for each man. Three spare cabins, with a separate bath and W.C., situated under the after end of the bridge, can be used for isolation purposes if necessary. In an interesting letter which we print elsewhere Major W. E. Home gives his personal experiences of the old conditions and points out to whose efforts the improvement is principally due. The National Seamen and Firemen's Union may be congratulated on the success of their efforts in thus securing for their men many of the improvements which we have long been demanding for them.

INFECTION OF SIMPLE FRACTURES.

IN the *Boston Medical and Surgical Journal* Dr. J. B. Blake has described a very unusual phenomenon which does not appear to have been previously recorded—infection of simple fractures paralleling in intensity and duration the infection which is still too common in compound fractures. Among the large number of fractures treated at the Boston City Hospital he has seen 10 or 12 such cases in the past 20 years. They occurred principally in the working class, among whom conditions favouring sepsis are common. The following are examples. A thin, feeble, elderly man was crushed in an elevator accident. The right humerus was broken and much comminuted and the arm was contused and scratched. On the day after admission his temperature began to rise, and on the third day there were obvious signs of infection of the arm. On incision a large amount of pus was found. He died on the sixth day. A labourer, aged 50 years, sustained fracture of both bones of

the leg in consequence of falling in of a bank of earth. There were no scratches on the leg, but large blisters formed immediately. In spite of careful dressing, signs of suppuration became evident, and incision and drainage were carried out on the fifth day. The suppuration involved not only the muscles but the ends of the broken bones. After a tedious convalescence he recovered with an unexpectedly good result, though there was some overlapping of the fragments and stiffness of the ankle-joint. In a case of fracture of the os calcis, due to a fall, there were no scratches or discolouration of the skin. Yet pus formed on the outer surface of the os calcis. Good recovery took place under incision and drainage. Dr. Blake thinks that the infection is due to entrance of bacteria through the skin, either by way of a scratch, a hair follicle, or blisters, and that it rarely arises from the circulating blood in a manner similar to what occurs in acute osteomyelitis. A number of factors predispose to infection. The general resistance of these patients is often diminished by hard work, age, or alcohol, and the skin over the site of fracture is often very dirty. Tearing and crushing of muscle, increased at times by rough handling, is another factor. This produces an ideal culture medium for any bacteria which may gain access by the skin or blood stream. The treatment is primarily preventive. More than usual care should be given to cleansing the skin and the treatment of blisters. When suppuration occurs incision and drainage and the routine treatment of compound fractures are indicated.

JAUNDICE PRODUCED ARTIFICIALLY BY PICRIC ACID.

THE considerable number of cases among Italian troops of jaundice of the ordinary catarrhal type, or symptomatic of general affection, or met with in an epidemic form of spirochætal origin, has suggested the suspicion that the artificial production of some cases may possibly have been overlooked. Two cases of the kind are recorded by Professor Giovanni Masnata,[1] who noticed among 134 cases of jaundice in the hospital at Stradella two soldiers who, at the expiration of their leave, presented themselves with apparently unmistakable signs of catarrhal jaundice; two days previously they had been perfectly well. The urine was deep orange in colour, but the most delicate tests failed to reveal the presence of bile pigment, while it contained a decided quantity of pseudo-albumin of toxic origin and picramic acid. Both the soldiers confessed to having taken powders of crystallised picric acid every 24 hours in doses of 0·75 to 1 gm. The conjunctivæ became yellow and the urine orange in about 24 hours after the first dose, which caused severe epigastric pain, loss of appetite, nausea, and a thickly coated tongue. The stools were not pale, but yellow-tinted; in one of the patients there had been a diffuse scarlatiniform eruption and in the other a rise of temperature to 37·8° C. The presence of picramic acid was still met with in the urine 17 days after the last dose of picric acid and the coloration of the conjunctivæ and skin persisted for about the same period. An accurate diagnosis of jaundice produced artificially by ingestion of picric acid necessitates, according to Professor Masnata, careful clinical investigation with a view to proving the absence of bile pigment and, on the other hand, the presence of picramic acid in the urine of suspected cases. A note on the laboratory methods used in investigation was sent us by a correspondent from the Military Hospital at Lyons and appeared in THE LANCET of July 8th, 1916, p. 81. The classical test of Gmelin not being adequate, Prof. Masnata recommends that of Grimbert. To 10 or 200 c.c. of urine, according as is necessary for the estimation of large or small quantities of picric acid, is added an equal quantity of a barytic mixture prepared by mixing one part of a saturated solution of chloride or nitrate of barium with two parts of a solution of pure hydrate of barium saturated in the cold. An abundant precipitate is formed which, together with carbonate, sulphate, and phosphate of barium, contains all the bilirubin present in the urine in the form of bilirubinate of barium. This precipitate is collected on a filter and washed with water, and will be found to be yellow if the urine contains bile pigment; otherwise it will be white. On dropping some of it into a test-tube containing 4 or 5 c.c. of a 5 per cent. alcoholic solution of hydrochloric acid and plunging into boiling water for about a minute a more or less intense green colour demonstrates the presence of bile pigment. To ascertain the presence of picramic acid in the urine the following method is recommended. To 100 c.c. of urine 10 c.c. of a 10 per cent. neutral acetate of lead are added. This is filtered, and to the filtrate are added 20 c.c. of a 25 per cent. solution of sulphuric acid. After further filtration, the new filtrate is shaken up with about 5 c.c. of chloroform. The chloroform is separated, and an equal amount of a 10 per cent. solution of ammonia added, when a red colour will indicate the presence of picramic acid, which may be rendered still further evident by introducing by means of a pipette below the chloroform a small quantity of de Mithouard's reagent, prepared by dissolving 2 gm. of ferrous sulphate and 10 gm. of tartaric acid in 100 c.c. distilled water. A blood-red ring forms at the point of contact.

[1] Il Policlinico, May 27th, 1917, Practical Section.

"CHINA HAIR" AND ANTHRAX.

Dr. F. J. H. Coutts's recent report[1] to the Local Government Board on the spread of anthrax by means of infected shaving-brushes drew wide attention to a danger which was exposed by Dr. R. R. Elworthy in our columns as long ago as Jan. 1st, 1916. Inquiry showed that the hair used in making these brushes consisted largely of Chinese horse hair—wrongly labelled "goat's hair"—which had not been disinfected before manufacture into brushes. Practically all this so-called "goat's hair" comes from China, London being the principal market for the trade in "China hair," which, prior to the war, was frequently re-exported to Belgium, Germany, France, and America. Before 1914 English manufacturers avoided the use of this material, either because it was notoriously liable to be infected with anthrax, or in order to avoid difficulties caused by Home Office regulations. On the outbreak of war there was a great demand for brushes of all descriptions, so that manufacturers were compelled to use this Chinese material. Immediate steps have been taken to disinfect the contents of the factories implicated and to destroy brushes known to have been made of infected hair. The manufacturers further undertook to deal with only disinfected hair for the future. Of the civilian anthrax cases subsequently occurring no fewer than seven were

[1] THE LANCET, June 30th, p. 1022.

traced to manufactories thus implicated. In most of the seven the brushes had probably been made before August, 1915; consequently the disinfecting efforts are not proved to have failed. In one or two instances, however, brushes have been found to contain anthrax spores notwithstanding that disinfection is presumed to have been carried out. It has been ascertained that both the first and the second retailers who supplied the brushes detailed in the report had received an incriminated pattern of brush from the same wholesale dealer, over 25 gross of these brushes having been distributed to various firms between the months of March and August. By the time the alarm was given brushes had been despatched to New Zealand, Brisbane, and Sydney, and with regard to these steps were taken to bring the facts before the High Commissioners of the respective colonies. It must be confessed, however, that although a considerable number of the brushes were traced and destroyed, many had already been sold to private purchasers and could not be traced. A considerable proportion of these brushes were infected, so that there is good ground for hope that transference of the disease to the users has been very rare. Dr. Coutts's report contains accounts of at least 28 cases occurring among soldiers prior to August, 1915. Inquiries were made by the medical inspectors of the Board into several of these cases, but difficulty was experienced in obtaining definite proof of shaving-brush infection, although the site of lesion frequently suggested this origin in the absence of other suspicious cause. In several instances the patient's shaving-brushes were examined for anthrax spores, but with negative results. The possibility of infection from other sources must therefore be admitted among military patients, such as contact with infected horses, stables, ground, or blankets. But the striking preponderance among the cases of the sites in the shaving area suggests connexion with shaving. Moreover, it is known that some of the consignments of infected brushes were distributed to the troops. Ordinarily it is the practice in the Army to supply soldiers with this equipment direct from the stores, but in the early stages of the war local military authorities had provided shaving-brushes purchased locally, and some of these were certainly of the imitation badger-hair type made from Chinese mohair. For the reasons specified the failure to find anthrax bacilli in the brushes used by military sufferers does not, in the absence of other modes of infection, negative entirely the possibility that some of the cases were due to infected shaving-brushes. Dr. Coutts remarks, in conclusion, on the long period during which anthrax spores may remain dormant and yet develop in full virulence on the return of favourable conditions.

ALTERATIONS AND AMENDMENTS IN THE BRITISH PHARMACOPŒIA (1914).

WE noted last week that owing to action taken by the General Medical Council a number of preparations containing glycerine or sugar had been excluded from the British Pharmacopœia. An official announcement from the Council warns the medical and pharmaceutical professions of the withdrawal from the Pharmacopœia until further notice of the medicines and compounds, and of the directions for preparing them, set forth in the following schedule, the medicines and compounds ceasing to be included among the official preparations of "The British Pharmacopœia 1914" until legal order respecting them is made:—

All confectiones, *except* confectio piperis, confectio rosæ gallicæ.

All glycerina, *except* glycerinum.

All misturæ, *except* mistura cretæ, mistura ferri composita, mistura olei ricini.

All syrupi, *except* syrupus, syrupus chloral, syrupus codeinæ phosphatis, syrupus ferri iodidi, syrupus ferri phosphatis cum quinina et strychnina, syrupus glucosi.

All trochisci, *except* trochiscus krameriæ et cocainæ, trochiscus morphinæ, trochiscus morphinæ et ipecacuanhæ.

Also caffeinæ citras effervescens, decoctum aloes compositum, extractum gossypii radicis corticis liquidum, linimentum potassii iodidi cum sapone, liquor calcis saccharatus, magnesii sulphas effervescens, mel boracis, pulvis amygdalæ compositus, pulvis glycyrrhizæ compositus, pulvis tragacanthæ compositus, sodii citro-tartras effervescens, suppositoria glycerini, tinctura cardamomi composita, tinctura kino, tinctura pruni virginianæ, tinctura rhei composita, tinctura sennæ composita, unguentum iodi.

THE subdirectorships at the Institut Pasteur, Paris, rendered vacant by the death of M. Chamberland in 1908 and Professor Metchnikoff in 1916, have been filled by the appointment of Dr. Albert Calmette, director of the Institut Pasteur at Lille, and Dr. Louis Martin, director of the Hôpital Pasteur. President Poincaré, ex-President Loubet, and heads of several State departments were present at the Council which confirmed the appointments.

THE BELGIAN DOCTORS' AND PHARMACISTS' RELIEF FUND.

A MEETING of the committee was held on August 2nd at the offices of THE LANCET, when a letter was read from M. Émile Vandervelde which had been received by the Editor of THE LANCET, asking that the work of the charities for the assistance of Belgians, now being carried out in England, should be kept before the public. The committee thought that the omission of the Belgian Doctors' and Pharmacists' Relief Fund from the list of charities enumerated by M. Vandervelde was explained by the fact that the Fund had never appealed for public support, although money had several times reached it from lay sources.

A message from the Central Medical War Committee was read, inquiring as to the presence of Belgians at Milford Haven who demanded the attention of local British practitioners. Sir Rickman Godlee explained that at the Central Medical War Committee the care of these Belgians, said to number 1500, had been put forward as one of the duties of local practitioners, and it had been suggested that a Belgian might be found to do the work and relieve the British doctors.

The accounts of the Fund for the half-year ending June 30th, duly audited by Messrs. Crewdson, Youatt, and Howard, chartered accountants, were submitted:—

Receipts.

	£	s.	d.
Dec. 1st, 1916:			
Balance	10,588	5	3
June 30th, 1917:			
Donations	348	3	6
Interest	240	5	6
Total...	£11,176	14	3

Payments.

	£	s.	d.
Relief	5,638	15	0
Clothes	37	3	1
Administration expenses...	23	2	10
	5,699	0	11
Balance at bank £2,511 13*s.* 11*d.*; Treasury Bills at cost, £2965 19*s.* 5*d.*	5,477	13	4
Total...	£11,176	14	3

The Treasurer said that the receipts since the last meeting had been small, but that no appeals had been made for some time. The expenditure on relief in England was also small now, but £800 a month had been sent to Belgium during May, June, and July. The committee decided to continue to send this mensuality, being assured of its safe receipt by those for whom it is intended. Dr. Des Vœux said that the bank interest received since the Fund started was £566 10*s.* 5*d.* and the interest on Treasury Bills £499 7*s.* 4*d.*, making a total of £1065 17*s.* 9*d.* interest accrued to the Fund. The Clothes Bureau is now at the St. Andrew's parish rooms, Palace-street, Westminster, and as the year goes on the need of clothes will again become acute.

"ROPY" BREAD.

BY J. M. BEATTIE, M.A., M.D. EDIN.,
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AND
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(*From the Bacteriological Laboratory, University of Liverpool.*)

THE condition of "ropiness" in bread, which has made recently its appearance in various districts, has led us to report in a preliminary manner some observations and experiments made in the University of Liverpool some years ago under the direction of the late Sir Rubert Boyce—and with which one of us was associated—and to repeat some of the work then undertaken.

Review of Literature.

The change known as "viscous fermentation" in substances containing carbohydrates is a fairly common occurrence, and is most frequently observed in milk, beer, and wine, and less frequently in bread, producing the so-called "ropy bread." This type of fermentation has been associated with several varieties of micro-organisms.

Emil Laurent in 1885 studied "ropiness" in bread and isolated an organism which he called *B. panificans*. He considered that the organism played a part in the normal fermentation of dough. Kratschmer and Niemilowicz in 1889 isolated *B. mesentericus vulgatus*, and regarded this as causal. Uffelmann in 1890 found two organisms, one of which he recognised as *B. mesentericus* and the other as *B. liodermos*, previously discovered by Löffler in cows' milk.

Other observers point out that the spores of the causal organisms originally present in the flour will still be found alive in the finished loaf. Further, that batches of bread containing much bran are especially liable to this disease, since it is on this part of the grain, and not on the enclosed flour, that the bacteria reside.

Lehmann and Neumann describe the *B. mesentericus vulgatus* (Flügge) as a motile slender rod with ends scarcely at all rounded and having round to oval spores. Its colour on agar is white to whitish-grey, moist and shining, luxuriant with a wavy scalloped border and having a fatty lustre. Later the medium becomes covered with numerous irregular elevated folds. It produces a slimy deposit in milk with an alkaline reaction. Its growth on potato is "exceedingly variable" and on the surface of broth it produces a greyish-white film. Lehmann and Neumann speak of this bacillus as being able to *produce* abundant quantities of a slimy carbohydrate, especially in feebly acid bread. Vogel studied the bacteriology of viscid bread in Hamburg and found especially two varieties of bacilli concerned with it—*B. panis mesentericus viscosi 1* and *2*. He considered that variety No. 2 corresponded with *B. mesentericus fuscus* (Flügge).

B. panis mesentericus viscosus 1 is stated by Lehmann to be distinguished from *B. mesentericus viscosus 2* by its "lack of motility" and its non-characteristic growth on potato. During our investigation a culture of *B. panis mesentericus viscosus*, variety not stated, was obtained from Kral's laboratory, but it failed to produce ropiness in bread.

We have not been able to find any recent literature on the subject, but the above brief review shows that most observers consider the causal organism to be one or other variety of *B. mesentericus*.

Original Observations.

The original observations made several years ago were undertaken because of an apparently spontaneous development and spread of a condition which rendered many hundreds of loaves quite unfit for human food, although, prior to its manifestation, a loaf appeared and tasted perfectly normal.

As found in the epidemic under consideration, loaves would be taken out of the oven in an apparently perfect condition. No abnormality could be found either in colour, texture, or flavour, and yet after remaining for two or three days the flavour and colour would become unfavourably altered and the interior of the loaf, instead of becoming dry, would retain its moisture and develop a certain stickiness. Often, when a portion of the crumb was taken and gently pulled apart by the fingers, an exceedingly fine intervening silken thread could be detected. If, however, the loaf was left in a warm and a moist atmosphere the interior of the loaf would become greatly discoloured and disorganised—the previously white crumb of perfect texture would give place to a brown glutinous mass of a very decided, penetrating, and nauseous odour. The mass was always found in the centre of the loaf.

When one of the silken strands was isolated it was found to consist almost entirely of a mass of Gram-positive, sporing bacilli. The organism, when isolated from a strand in an infected loaf, proved to be a member of the *B. mesentericus* group, and its culture, when inoculated into a sterilised loaf, produced all the conditions previously noted in the naturally infected bread.

During the investigation it was found that several members of the mesenteric group of bacteria could generally be isolated from perfectly good bread, but that the special member of the group which we isolated from "ropy" bread, and which we believed to be causal, had certain specific characters, and it was necessary to show that this organism was itself able to produce the typical characteristics of "ropy" bread, and that others were not able to do so.

The various types of organism were isolated in pure culture; small loaves wrapped in paper were sterilised in the autoclave at one and a half atmospheres pressure for 30 minutes, and then, on cooling, inoculated by means of a finely-pointed pipette with pure cultures of the various types of organism, with mixtures of the organisms, and with emulsions of suspected flour.

In this way it was shown that only one of the varieties, which we, following Vogel, propose to call *B. viscosus panis*, was able to produce the characteristic ropiness. Others produced sourness of various types, whilst others apparently had no effect.

Origin and Characteristics of the Organism.

Attention was directed to the origin of the organism—i.e., to the source of infection, and for this purpose all the ingredients used in bread making were repeatedly examined, i.e., water, salt, flour, and yeast. Large numbers of samples of flour were tested and many samples of yeast from different sources.

The organism was never found in water, salt, or yeast, but was present in many samples of flour irrespective of their market value. It was found in bakery dust, as might be expected, *and also in flour direct from the mills*, i.e., flour which did not come into contact with the bakery at all.

All this evidence seemed to prove that although some local factor might be responsible for the condition assuming epidemic proportions, yet its origin had to be looked for external to the bakery.

Experiments were, therefore, directed to this end, and it was shown that the washings obtained from wheat grains were capable of producing ropiness in experimental sterilised loaves, and the typical organism was isolated. The details of such an experiment are as follows:—

A number of whole grains of wheat were well shaken in 5 c.c. of sterile water, the water was then filtered and injected into sterile loaves. After 48–72 hours' inoculation, the typical condition could be detected in the loaves, and the organism could be isolated without difficulty. Pure cultures were obtained and their identity proved.

This seemed to prove that the flour was infected during the process of milling, but it at once occurred to us why, if this was the case, should one particular bakery suffer severely from ropiness, while other bakeries, using flour from the same source, had no ropiness, or only a slight degree of it? Investigation showed that the greater trouble arose from the fact that a considerable amount of bread, specially baked for sale as bread-crumbs and to be used in other industries, were powdered in a grinding machine in a room where the bread-dust arising from the machine could gain access to the flour room. This caused an added infection, for when the grinding machine was removed, the trouble disappeared. The conclusion was that the infection was in the flour, but that active development only took place in the bread when the organism was present in considerable numbers.

The organism itself, is, as previously mentioned, a Gram-positive sporing bacillus, aerobic and belonging to the mesenteric group, but apparently specific for this infection. When grown on agar the appearance of an early colony is very striking. It looks like a small drop of thick, transparent, colourless oil, and when touched with a needle is shown to be extremely viscid. If an attempt be made to remove the colony, it will be found that the growth follows the needle and can be drawn upwards if handled gently

until a strand, one or two inches in length, reaches from the agar to the end of the needle. It is therefore very difficult to detach a portion of the colony. As the colony develops the clear oil-like character disappears and a ground-glass opacity is assumed, giving rise later to a dry, wrinkled, typical mesenteric appearance, but the viscosity of the growth is seldom entirely lost. The fresh-growing edges invariably show this special characteristic. The organism is non-motile and forms, in peptone water, a thick transparent mucilaginous film, very different from the "greyish-white film which is not broken up by shaking" of *B. mesentericus vulgatus*.

If a "ropy" loaf of bread be cut or broken, small glistening masses may be found. These are colonies of the "rope" organism, and the silken strands which may be seen when portions of the bread are gently drawn apart are, in fact, only the viscid colony stretching from crumb to crumb. When the growth in the loaf is well advanced, then the whole mass of bread may become viscid.

Causation and Prevention.

The question arises as to whether the organism here discussed is the only cause of ropy bread. This, of course, cannot at the moment be answered with complete satisfaction. It can, however, be said that the causal organism in this particular epidemic and in the recent one which we have examined is not the ordinary *B. mesentericus vulgatus*. As we have said, types of this mesenteric group produce, when injected into sterile loaves or inoculated into plugs of sterile bread (made after the manner of making potato media), varieties of fermentation (e.g., lactic and butyric acid), but only one of those we have been able to isolate gives rise to "ropiness."

These organisms, being spore-producers, are not killed by subjecting them to the temperature maintained inside the loaf while the latter is being baked.

In the present outbreak of "rope" in bread we have now had the opportunity of examining many infected and non-infected loaves. The result of the examination is identical with that of the initial investigation. Large growths of mesenteric colonies are obtainable from all the loaves, whether infected or not, but from the infected loaves the same organism as that previously found has been isolated. This new strain behaves exactly as the original one did—its growth on plates, the production of strands, &c., and its growth in bread is accompanied by the same degeneration of the bread and the same sickening odour. The first epidemic here mentioned was local and occurred 11 or 12 years ago; the present one is widespread, but the organism causing both is the same. It is therefore, in our opinion, very probable that the organism causing ropiness in bread is a definite and specific organism and must not be confused with other members of the group known as "*B. mesentericus*." It is misleading to say that "rope is caused by *B. mesentericus*," and it is equally wrong to say that the condition is due to "dirt," if it is meant that unclean or insanitary conditions in the bakehouses or in the workers are responsible for the condition. Our experience is that the condition may occur in bakehouses where the sanitary conditions are most satisfactory.

The fact that the causal organism has been found in the husk of the grain and in the flour suggests that the infection is more likely to occur where the flour used contains a greater proportion of husk. There is no doubt that the development of the organism in the bread is greatly favoured by moisture and warmth—conditions which would be established by the storage of bread, after baking, in a close room with no air space between the loaves, and especially if covered with cloths which become damp from the escaping moisture of the new bread. If the distribution of bread is not to take place within 24 hours after baking it seems essential that it should be stored in a well ventilated and cool room. It may be that modification in the baking process may inhibit the growth of the organism and even prevent its after development, but the only reasonable procedure is to eliminate the organism from the flour. The fact that "ropiness" has not shown itself in the bread in this area for a long time and has made its reappearance under the new conditions of milling seems to suggest that it can be eliminated when proper methods and standards are used in the production of flour.

We are at present making further investigations as to the life-history and distribution of the organism, as well as to its chemical and possible pathological effects. Though it is said that no pathogenic effects are produced by the consumption of ropy bread, there can be no doubt that when the bread is so heavily infected as some we have recently seen it becomes unfit for human consumption, and from the point of view of economy in our bread-supply, to say nothing of the health question, it is of extreme importance that a thorough investigation of the subject should be undertaken and the disease dealt with at its source. In our opinion, it is futile to deal with this disease, as has been recommended, by adding acids during the process of baking—the organism itself produces an acid reaction in certain media and an alkaline one in others, though there is no doubt that the acid, if present in sufficient quantity, will inhibit its growth.

GENERAL REPORT ON THE CENSUS OF 1911.

WE have received from Sir Bernard Mallet the General Report on the last Census of England and Wales,[1] to which are appended statistical summaries of the Census results (*a*) in other divisions of the United Kingdom and (*b*) in the British Empire. This report, the appearance of which has been seriously delayed by war conditions, constitutes a valuable epitome of the ten detailed volumes already circulated. It is issued on the joint authority of the Registrar-General and the Medical Superintendent of Statistics.

Origin and Development of the Census.

Among European nations England is singular in this respect that it has hitherto established no permanent statutory authority for the periodical enumeration of its population. Nevertheless 12 English Censuses have already been taken under as many special Acts of Parliament which, with sundry modifications, have been passed at decennial intervals since the opening of last century.

A few years before the Census of 1841 two important statutes received the Royal Assent. Under the Act of 1834 the remarkable system of Poor-law unions was created, forming a somewhat complex network of registration areas throughout the country. By a supplementary Act passed two years later, the civil registration of Births and Deaths in England and Wales was established. Under this statute the newly-created "unions" and their subdivisions were adopted as statutory areas for administrative purposes. Taken together these measures have not only led to far-reaching improvements in Census methods, but—what is of scarcely less importance—they have formed the basis of all subsequent legislation for the sanitary progress of the community. Neither the methods of conducting a Census nor the objects to be attained thereby had ever been made the subject of official investigation in England until 1890, in which year a Departmental Committee recommended, *inter alia*, that inquiry should forthwith be instituted concerning (*a*) the number of rooms occupied by families living in fewer than five rooms, and (*b*) the number of persons engaged in each trade or industry, whether as employers or employed. These inquiries were first inserted in the Census schedules of 1891, and with some modifications have been retained ever since. Originally restricted to tenements of fewer than five rooms, scrutiny has now been extended to tenements of all sizes, the object evidently being to check overcrowding of dwellings, the prevalence of which in certain districts has become notorious. In response to a demand for particulars respecting the occupations of young persons, the ages of workers in each industry have now been tabulated by single years from 10 to 21. This information, now available for the first time, provides valuable material for the study of problems concerning youthful labour.

A prominent feature in the literature of the recent Census is the practically complete substitution of administrative for other types of area as the local units of tabulation, many statistical facts having been abstracted for the first-named areas alone. In the successive annual reports of the Registrar-General since 1910 the administrative has superseded the registration area as the statistical unit. By this device the reports of local medical officers of health have been brought into relation with the statutory records of

[1] Census of England and Wales—General Report. Folio, pp. 533. H.M. Stationery Office. Price 4s. 6d. net.

Somerset House; the national statistics being thus made available to scientific inquirers generally, and especially to those practically interested in public health work. In default of a much-needed legislative reform identifying registration with administrative boundaries, the transfer from one set of areas to another has presented serious difficulties. These, however, have been partially overcome by the employment of a system of mechanical card sorting and counting, thereby economising labour and conducing greatly to accuracy of result. Moreover, the adoption of the card system has diminished the clerical labour of transferring from the place of its occurrence to the area of previous residence a death recorded elsewhere than at home. It is worthy of note that, with the voluntary coöperation of our profession, transference of this statistically desirable kind is now effected in about 40,000 instances annually.

Changes in Methods.—Present Distribution of Population.

Certain fundamental changes have been made in the methods of Census taking since 1841. Prior to that year the data had been recorded by local officials, but from 1841 onwards that duty has been transferred to the householder. In face of continually increasing demands for improvement of Census tabulation it is questionable whether the duty of record should not be re-transferred to the enumerator. This has for many years past been the practice in the United States of America. Our present authorities are specially attracted to the system now obtaining in India, which is, broadly, as follows: Shortly before the appointed Census day the enumerator visits every house in his district, but, instead of merely leaving the schedule to be filled in by the householder, the enumerator himself secures the necessary information by questioning the individual inmates, and filling in the particulars in the schedule. On the arrival of the Census day he re-visits the house, enters in the schedule the number passing the previous night in the house, and makes other corrections where necessary. The suggestion that some such system as the foregoing should displace our present hardly effective practice seems reasonable. For in that event, instead of trying to educate the masses of the people, whether by means of lessons to children at school or by the general diffusion of instruction through the newspapers, it would only be necessary for each registrar to train his own small staff of enumerators. In this way not only would the data be collected by paid officials familiar with the schedule, who could be called to account for avoidable error, but the public would be spared the unwelcome task of attempting to puzzle out for themselves the requirements of the schedule. What is especially to be hoped for in this connexion is the eventual coördination of the local arrangements for registration and administration, by which means the provision of efficient enumerators would certainly be facilitated.

Arising out of existing war conditions, one vitally important point presents itself for decision by way of preparation for another Census. The distribution of the population has been so seriously disturbed as to invalidate all computation of ratios for the purpose of vital statistics. For the year 1915 the results of the National Register have been utilised. But unless either this practice is maintained, or else a simple form of Census is undertaken at the conclusion of hostilities it will almost certainly be necessary to discontinue entirely the publication of rates. It may be hoped, however, that before the arrival of another Census year there will be some return to normal peace conditions, and that emigration, in so far as it depends on war, will have done its work, so that the restoration of industry to orderly lines may speedily be achieved.

Suggestions for a Quinquennial Census.

Our present authorities do not consider the existing system of enumeration adequate to all the requirements of a population Census carried out only once in ten years. They nevertheless recognise that this system would be found needlessly expensive for a simple count of the population in the middle of each intercensal decennium. Suggestions are offered whereby the cost of such a Census would be materially reduced. Among these is included the plan of delivery and collection of schedules through the post according to the scheme for postal enumeration put forward by the present director of the Census of the United States. A further suggestion is that the local authorities may be encouraged to carry out enumerations in their own areas on a fixed date, the necessary forms being provided and the tabulation carried out by the permanent office in London. The local authorities are favourably situated for organising and carrying out work of this kind, being already in the habit of doing much of what would be required in the yearly revision of their rate-books. The staff in their regular employ would constitute a reliable nucleus, and if the local police were included might in many cases suffice for the whole duty. By one or other of the methods outlined in the report it is believed that machinery may be devised for a simple intermediate Census, by which the cost, which is apparently the sole objection to the proposal, may be substantially diminished. Whilst hesitating to furnish the details of any of their suggested plans, the writers express the hope that every possibility may be exhausted before deciding, ten years hence, that the oft-repeated demand for a quinquennial enumeration must once more be refused. In the event, however, of the choice lying exclusively between the maximum improvement of the decennial Census on the one hand and the establishment of a quinquennial Census on the other, the writers deliberately incline to the former, holding the conviction that in Census matters especially quality is preferable to mere quantity.

Population—Industries and Occupations.

By the term "population" in this country has always been meant the number of persons actually present in any area at the date of the Census. The total number returned as living in England and Wales at midnight on Sunday, April 2nd, 1911, was 36,070,492. This revised total showed an increase of 3,542,649 upon the number returned at the preceding Census in 1901, corresponding to a decennial rate of increase of 10·9 per cent. This rate of increment was the lowest experienced since the date of the first Census. The satisfactory definition of "a house" has baffled the ingenuity of several generations of Census authorities. At each of the English Censuses from 1851 to 1901 a house was defined as being "all the space within the external and party walls of a building." The statistics hitherto given in the Census tables, relating as they do to houses of widely different types, lose much of their possible value because of the indefinite character of the material classified. Accordingly, for the purposes of the last Census it was decided to make a new departure. Details respecting families or separate occupiers are given as heretofore for each area dealt with, but returns of buildings have been presented for urban and rural districts alone. For these areas, however, the various kinds of buildings are classified in sufficient detail to obviate the indefiniteness of previous returns. For example, we now know how many blocks of flats exist in a given town, how many separate flats or tenements are contained in these blocks, and what is the population inhabiting each of them.

At every Census hitherto taken in this country all that relates to the occupations of the people has been regarded as matter of supreme importance, and the method and scope of inquiry have been modified from time to time in accordance with cumulative experience. The results of the earlier Censuses, however, can hardly be considered completely successful. In 1841 advantage was taken of the recently established system of civil registration to remodel the machinery of the Census, the result being that instead of numerical summaries prepared by the overseers of each parish particulars of individual persons were recorded on schedules furnished to every householder and collected by enumerators acting under the direction of the local registrars of births and deaths. For the purposes of the 1901 Census an elaborate revision of the official classification of occupations was undertaken, and the changes then made will be found enumerated in the general report of the Census of that year. By way of preparation for the recent Census the whole subject was again thoroughly considered, but having regard to the importance of continuity no serious modification of the classification then in force was attempted.

Infirmities—the Blind, the Deaf, the Insane.

An endeavour to ascertain particulars respecting those suffering from infirmities was first made in 1851, but neither then nor since have the results been beneficial. In their remarks on this topic the present Census authorities are constrained to admit that statistics of this nature, obtained by means of a general population Census, are most unsatisfactory: firstly, on account of the difficulty of framing a suitable form of inquiry; and, secondly, because of the lack of technical

knowledge on the part of relatives and others required to fill up the schedules. This view was strongly taken by the Census Commissioners of 1881, who reported thus: "We feel bound to point out ..... how very incomplete are the returns which relate to these afflictions, and more especially those which relate to idiocy and imbecility. ..... We cannot, however, but express our decided opinion that statements made by persons as to the deficiencies, mental or bodily, of their children or other relatives are not worth the cost and labour of collection and tabulation." Again, the report on the Census of 1891 characterised these statistics as "in all probability excessively inaccurate," while in the report for 1901 it is stated: "Concerning the above-named infirmities it should be clearly understood that the machinery of an ordinary English Census is but imperfectly adapted to furnish the required particulars with that accuracy which is essential for statistical purposes." The Royal Commission on the Care and Control of the Feeble-minded have reported to the like effect. Holding similar views our Census authorities writing in the present report say: "It is because experience has impressed us with this conviction that we have abstained from entering into minute details which, had the data been more reliable, would have proved highly instructive and useful." Several summary tables are given in the appendix showing the sex, age, and marital condition of persons returned as blind, deaf and dumb, lunatic, imbecile, or feeble-minded. But the reporters conclude their remarks on this subject with the statement that, inasmuch as their experience does not encourage the hope that the figures are appreciably more accurate on this than on previous occasions, they have not felt justified in entering upon an elaborate analysis of them. Their present comments are therefore confined within narrow limits.

MEDICINE AND THE LAW.

Poisoning by Cocaine obtained by a Plausible Tale.

AT a recent inquest, at which, in the Westminster Coroner's Court, a verdict of suicide was returned, it was proved that M. E. Berg, a soldier who had been wounded and had been discharged from the Army as medically unfit, had obtained a prescription for an ounce of cocaine from a medical man by what the coroner characterised as a "cock-and-bull story." He was afterwards found dying in a public lavatory with an empty phial which had contained cocaine and a hypodermic syringe beside him. The ease with which the drug had been obtained was commented upon by the coroner.

The Sale of Milk Regulations, 1901.

According to the first of the above regulations: "Where a sample of milk (not being milk sold as skimmed, or separated, or condensed, milk) contains less than 3 per cent. of milk-fat, it shall be presumed for the purposes of the Sale of Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the milk is not genuine, by reason of the abstraction therefrom of milk-fat, or the addition thereto of water." In the case of Grigg *v.* Smith the justices at Stratford-on-Avon recently refused to convict the owner of a cow which had recently calved, and in the udder of which some milk had been left in milking, although the milk sold to the inspector undoubtedly contained less than 3 per cent. of milk-fat. In other words, the justices held that in accordance with the regulation and with the decison in Hunt *v.* Richardson, 32 Times Law Reports, 560 (1916), the product was sold as it came from the cow, and so was genuine milk, even though deficient in milk-fat. The Divisional Court has since dismissed an appeal against this decision, holding that it was in accordance with the judgment of the court in Hunt *v.* Richardson and was correct. There was a presumption, if the milk was deficient in milk-fat, that it had been adulterated, but this could be rebutted by evidence and had been so rebutted in the case before the court. The Lord Chief Justice, however, in delivering judgment, and the judges who concurred with him, expressed the opinion that the law ought to be reconsidered by the departments concerned with a view to the introduction of amending legislation or regulation in the interest of the consumer. Mr. Justice Atkin pointed out that according to the case before the court a defendant must be held to have the right to give the preference to his calves over the babies of his customers. This was with reference to the leaving of the richer milk in the cow's udder for the calf to draw instead of extracting it by completing the milking until the udder was dry. The matter is one of some interest to the public. The 3 per cent. standard laid down by the regulation is by no means a high one, and if it were definitely insisted upon, farmer, milk-vendor, and consumer would know exactly where they stood. The last named, who after all is the most important, would run less risk of being sold milk defective in fat, and the two former would have a clearly defined position in the matter. They would have to provide the public with milk of a certain standard or to cease doing business. The farmer in particular would know that if he could not get from his cows, either by better feeding or better milking, or possibly by buying better animals, milk of the required quality he must give up dairy-farming. He would be placed beyond the temptation to feed his cows with a view to obtaining quantity without regard to quality, and he would not be able to bring forward the defence that the milk was sold as it left the cow, when this was not the case.

Obituary.

HERBERT FRANCIS HAYES NEWINGTON, F.R.C.P. EDIN., M.R.C.S. ENG.

THE death occurred at Ticehurst on July 31st of Dr. H. F. Hayes Newington, a member of a well-known family of medical practitioners in East Sussex. A son of the late Dr. C. E. Hayes Newington, he was born at Ticehurst 70 years ago. He was educated at University College, London, becoming M.R.C.S. Eng. in 1871. Proceeding to Edinburgh, he took the Licence of the Royal College of Physicians there in 1878, was elected Fellow of the Royal College of Physicians, and was for some time assistant physician of the Royal Edinburgh Asylum. He was joint proprietor of the Ticehurst Asylum, and specialising in mental diseases contributed some useful practical articles to the medical press, among them "Notes of a Case of Insanity Dependent on Syphilis," "Observations on Stupor," "Hemiplegia in Relation to Insanity," and "Some Mental Aspects of Music." He was treasurer, and at one time president, of the Medico-Psychological Association of Great Britain and Ireland. Dr. Hayes Newington took a very prominent part in local affairs in East Sussex and at the time of his death was an alderman of the East Sussex county council. He married in 1875 a daughter of Professor Archer, director of the Edinburgh Museum of Arts and Science, who survives him, and by whom he had two children.

Mr. J. F. Briscoe writes:—

As a physician of one of the largest private mental hospitals Dr. Hayes Newington practised his art with consummate skill at Ticehurst, and set an example in the management and care of institutions for the well-to-do insane. He had a long tenure of office in this special branch of the profession, and those whom he leaves behind will be the sufferers. Such private hospitals for the insane are of great need at the present day, and those who minister to the welfare of the inmates deserve every consideration from the profession. The life is a wearying one and is filled with care and great anxiety. Mistrust of these private mental hospitals is long since forgotten, for they are not only governed by legal statutory formulas, but they have the immediate eye of that beneficial commission, the Board of Control.

THE LATE DR. G. W. F. MACNAUGHTON.—Dr. George William Falconer Macnaughton, physician to the Kensington and Fulham General Hospital, died at his residence, Lower Belgrave-street, Eaton-square, on July 25th. A successful student at the University of Edinburgh, winning the Grierson bursary in anatomy and physiology in 1889 and in pathology and materia medica in 1890, he graduated two years later M.B., C.M., with honours, and in 1895 obtained the M.D., also with honours. In 1896 he became a Fellow of the Royal College of Surgeons of Edinburgh and in 1905 a Member of the Royal College of Physicians of London. Dr. Macnaughton was at one time physician to the Chelsea, Brompton, and Belgrave Dispensary, and had been assistant medical officer to the Worcester County Asylum. He made several interesting communications to our columns, and was a very well-equipped physician and observer.

The War.

THE CASUALTY LIST.

THE following names of medical officers appear among the casualties announced since our last issue :—

Killed.

Capt. G. S. Pirie, R.A.M.C., attached East Surrey Regiment, qualified at Edinburgh in the latter part of 1914.

Surgeon S. N. Toulmin, R.N., qualified at Edinburgh in 1915.

Capt. G. D. East, R.A.M.C., attached Grenadier Guards, was educated at Cambridge University and at St. Bartholomew's Hospital, London, and qualified early in 1914.

Died.

Capt. R. H. Bharucha, I.M.S., received his medical education at University College, London, and qualified in 1909.

Brevet Lieut.-Col. J. H. Horton, D.S.O., I.M.S., was a student at Guy's Hospital, London, and qualified in 1895. He held appointments at Bethlem Royal Hospital and at Guy's Hospital, and joined the I.M.S. in 1902. He saw active service in Somaliland, in connexion with which he was mentioned in despatches and was awarded the D.S.O. He had also done plague duty as a special medical officer in India, where he died.

Died of Wounds.

Capt. A. C. Edwards, M.C., R.A.M.C., attached K.O.Y.L.I., qualified at Liverpool in 1908, and was in practice at Bingley, Yorks, prior to joining the R.A.M.C. He had held appointments at the Southern Dispensary and at the Northern Hospital, Liverpool. The award of the M.C. is recorded in THE LANCET of June 10th, 1916, p. 1195.

Wounded.

Lieut. T. Archdeacon, R.A.M.C.
Capt. R. Dow, R.A.M.C., attached K.O.Y.L.I.
Capt. D. J. Evans, R.A.M.C.
Lieut.-Col. R. P. Lewis, R.A.M.C.
Capt. L. Meakin, R.A.M.C.
Capt. H. S. G. Haji, I.M.S.
Capt. J. L. Hamilton, R.A.M.C.
Lieut. A. A. Henderson, R.A.M.C., attached Essex Regiment.
Capt. J. W. McDonald, R.A.M.C.
Capt. J. P. Mathews, R.A.M.C.
Capt. R. A. Stark, R.A.M.C.
Capt. D. S. Twigg, R.A.M.C.
Capt. G. H. Barry, R.A.M.C.
Lieut. H. Dearden, R.A.M.C., attached Grenadier Guards.
Capt. S. Brown, M.C., R.A.M.C., attached R.F.A.
Capt. R. Vincent, R.A.M.C., attached R.F.A.
Capt. J. J. Walsh, R.A.M.C., attached Royal Inniskilling Fusiliers.
Capt. S. A. Bull, R.A.M.C., attached Lancs Fusiliers.
Lieut. J. E. E. de Robillard, R.A.M.C., attached West Yorks Regiment.
Capt. J. Dunbar, R.A.M.C., attached East Yorks Regiment.
Capt. A. J. McCreadie, R.A.M.C., attached Border Regiment.
Capt. D. C. Scott, R.A.M.C.
Lieut. W. S. Kidd, R.A.M.C., attached Manchester Regiment.
Capt. G. A. Renwick, R.A.M.C., attached Northampton Regt.

THE HONOURS LIST.

Among the awards announced in the latest *Gazettes* are the following :—

C.B.—Surg.-Gen. R. H. Quill, ret. pay, late A.M.S.; Surg.-Gen. J. C. Culling, A.M.S.; Col. A. Peterkin, ret. pay, late A.M.S.; Col. (temp. Surg.-Gen.) R. S. F. Henderson, K.H.P., A.M.S.; Col. R. J. S. Simpson, C.M.G., ret. pay, R.A.M.C.

K.C.M.G.—Col. (temp. Surg.-Col.) M. T. Yarr, C.B., A.M.S.

C.M.G.—Lt.-Col. W. Turner, ret., R.A.M.C.; Lt.-Col. J. M. Cotterill, R.A.M.C.; Surg. Lt.-Col. and Hon. Surg.-Col. D. Hepburn, R.A.M.C.; Lt.-Col. H. Littlewood, R.A.M.C.; Lt.-Col. G. S. A. Ranking, R.A.M.C.; Temp. Lt.-Col. W. N. Barrow, M.V.O., R.A.M.C.; Lt.-Col. J. C. Robertson, C.I.E., I.M.S.; Temp. Lt.-Col. W. L. W. Marshall, R.A.M.C.; Maj. (temp. Lt.-Col.) H. T. D. Acland, N.Z.M.C.; Maj. (temp. Lt.-Col.) D. S. Wylie, N.Z.M.C.; Lt.-Col. B. E. Myers, N.Z.M.C.

K.C.V.O.—Surg.-Gen. Sir A. T. Sloggett, K.C.B., K.C.M.G.

MENTIONED IN DESPATCHES.

The names of the following medical officers are gazetted for distinguished services rendered in connexion with the war :—

I.M.S.—Maj. (temp. Lt.-Col.) R. M. Carter.

A.M.S.—Surg.-Gen. Sir D. Bruce, Kt., C.B., F.R.S.

R.A.M.C.—Lt.-Col. F. W. Begbie; Lt.-Col. S. A. M. Copeman, F.R.S., T.D.; Capt. W. V. Corbett; Temp. Hon. Capt. W. M. Flack; Capt. A. G. R. Foulerton; Capt. H. G. Gibson; Capt. F. L. Golla; Temp. Hon. Maj. T. G. M. Hine; Temp. Hon. Lt.-Col. H. R. Kenwood; Lt.-Col. Sir A. Newsholme, K.C.B.; Temp. Capt. H. S. Raper; Temp. Hon. Lt.-Col. J. Robertson; Temp. Capt. F. R. Seymour; Capt. W. C. Smales, D.S.O.; Lt.-Col. J. Tidbury; Lt.-Col. A. L. A. Webb, C.M.G.

Australian Army Medical Corps.—Lt.-Col. J. Gordon; Maj. D. S. Mackenzie; Lt.-Col. H. S. Newland; Lt.-Col. H. R. G. Poate; Lt.-Col. H. A. Powell, C.M.G.; Lieut. H. E. Stevens.

Canadian Army Medical Corps.—Lt.-Col. J. A. Amyot; Lt.-Col. G. E. Armstrong; Capt. A. B. Chandler; Lt.-Col. J. T. Clarke; Lt.-Col. W. H. Delaney; Lt.-Col. D. Donald; Capt. W. J. Enright; Lt.-Col. C. H. Gilmour; Lt.-Col. P. G. Goldsmith; Capt. T. F. Graham; Capt. H. C. Hall; Lt.-Col. J. McCombe; Maj. S. H. McCoy; Capt. W. B. MacDermott; Maj. J. D. Morgan; Lt.-Col. H. E. Munroe; Lt.-Col. R. Raikes; Lt.-Col. H. M. Robertson; Col. R. D. Rudolf; Maj. R. E. Wodehouse.

New Zealand Medical Corps.—Maj. (temp. Lt.-Col.) H. T. D. Acland; Maj. F. T. Bowerbank; Maj. A. S. Brewis; Capt. (temp. Maj.) W. Bruce; Capt. N. H. M. Dalston; Capt. D. E. Fenwick; Capt. G. E. O. Fenwick; Capt. R. H. Hogg; Capt. W. Tweedy; Capt. (temp. Maj.) W. H. Unwin; Capt. W. S. Wallis.

THE SUPPLY OF MEDICAL OFFICERS FOR THE ARMY.

The Central Medical War Committee has signified to the War Office that no more medical men can be called upon to take commissions in the Royal Army Medical Corps without seriously endangering the supply of doctors for the treatment of the civil community. The following letter has been sent to Lord Derby :—

429, Strand, London, W.C., August 3rd, 1917.

MY LORD,—We are instructed to inform you that the Central Medical War Committee, after a careful survey of the whole of England and Wales, is of opinion that no more medical men can be called upon to take commissions in the R.A.M.C. without seriously endangering the supply of doctors for the treatment of the civil community, and that further depletion can only be effected on the responsibility of the Government after carefully comparing the military with the civil needs. A few more appeals still remain to be heard before the last man considered available by the Committee has entered the Army, but from September onwards it will be quite impossible, under present powers and conditions, to satisfy the large demands of the Army Medical Department, which are now stated to be greatly increased.

In this connexion the Committee desires us to remind you of the letters sent to you on April 25th, April 27th, and June 2nd, 1917, and the suggestions made therein.

We have the honour to be, my lord,

Your most obedient servants,

(Signed) N. BISHOP HARMAN, ALFRED COX } Secretaries.

The Right Hon. the Earl of Derby, War Office, Whitehall, S.W.

The Local Government Board and the National Insurance Commission, the two departments concerned with the health of the community directly, have received the same communication from the Central Medical War Committee.

THE MEDICAL EXAMINATION OF RECRUITS.

On June 26th a Select Committee was appointed to inquire into and report upon: (1) The instructions issued by the War Office with regard to the administration of The Military Service (Review of Exceptions) Act, 1917; and (2) the method, conduct, and general administration of medical examinations under the Military Service Acts, and to make recommendations. This Committee having held 15 meetings and examined 27 witnesses, has now brought in a Special Report, which is printed as a White Paper, obtainable from H.M. Stationery Office (No. 126; price 1*d.*).

The Committee decided, in the first place, to ask the authorities concerned to give them general official evidence in order to inform themselves of the general policy pursued and the methods and practice of the recruiting medical boards. How fully and frankly this was done the accounts we have published from week to week under Parliamentary Intelligence show, and we need not therefore reproduce the summary of this evidence given in the Report. The statement of the conclusions to which the Committee came is preceded by the following paragraph, which may be taken as a brief summary of their reasons :—

At the time when the Committee was appointed it was common knowledge that grave distrust and suspicion existed in the minds of the public with regard to the work of the recruiting medical boards. It may very well be that the percentage of errors by boards was small, whether those errors were due to bona fide mistakes or blind obedience to orders. But in dealing with such large numbers a small percentage of error produces a large volume of individual injustice and individual hardship. Practically everyone knew of, and was affected by some such individual cases, and the evidence which had been elicited by the Committee had converted distrust and suspicion into absolute certainty. The Committee, therefore, felt strongly that something should be done, and done promptly, to restore public confidence and to prevent further avoidable wrong.

The conclusions themselves, although doubtless now familiar to most of our readers, are given in our Parliamentary Intelligence columns.

OBITUARY OF THE WAR.

CLIVE ALAN WHITTINGHAM, M.B., CH.B. GLASG.,

CAPTAIN, ROYAL ARMY MEDICAL CORPS.

Captain C. A. Whittingham, who was killed in action on June 29th in his twenty-fifth year, was the son of Engineer Rear-Admiral W. Whittingham, C.B., of Crookston, Glasgow. He studied medicine with distinction at the University of Glasgow, assisting his brother, Dr. Harold A. Whittingham, in his research work at the Cancer Hospital, and taking the degrees of M.B., Ch.B. with commendation in April, 1916, but had two years before this obtained a commission as lieutenant in the R.A.M.C. (Special Reserve), undergoing a course of instruction at Aldershot in the summer of 1914. He was sent to France in May, 1916, where he served for a while with a brigade of Royal Field Artillery, and then, until his death, with the Royal Fusiliers.

A medical friend writes of Captain Whittingham's manly winning personality and as one for whom his associates foretold a distinguished place in medicine, although, going as he did direct from the University to the trenches, he had no opportunity of taking it. Others speak of his method and accuracy and special aptitude for scientific work. These qualities were combined in him with a consideration for others which made him an object of affection to his fellow-students and hospital patients. By the officer in command of his regiment he was described as one of the bravest men he had met, who, after being himself mortally wounded, continued to direct what should be done for others about him.

WILLIAM GEORGE BARRAS, M.D. GLASG.,

SURGEON, ROYAL NAVY.

Surgeon W. G. Barras, who was among the 600 officers and men on board H.M.S. *Vanguard*, which blew up on July 9th, was only surviving son of Dr. James Barras, of Govan. Educated at Bellahouston Academy and Glasgow University, he graduated in medicine in 1889, taking his doctor's degree three years later. After taking a public health diploma at Durham he started in practice at Govan, where his father had been parish medical officer for 50 years, and became himself deputy medical officer and police casualty surgeon as well as bacteriologist to the Govan municipality, a post which was very congenial to him. Associated all his life with the R.N.V.R., he had already been to Canada with them, and when war broke out was at once called up. He went through the Dardanelles sea campaign on the *Lord Nelson* and was 40 times under fire, as well as a witness of the explosion of the *Formidable* and *Bulwark*.

Surgeon Barras had many interests outside his professional work. He was a remarkable photographer, possessing a valuable collection of war photographs and a collection of curios and relics of the old village of Govan, which he bequeathed to the Y.M.C.A. A keen angler, he devoted what time he could spare to this pastime, and as a musician he was able to deputise on occasion for local organists. Surgeon Barras was unmarried.

WILFRID ARCHER SNEATH, M.B., CH.B. MANCH., F.R.C.S. ENG.,

MILITARY CROSS,

CAPTAIN, ROYAL ARMY MEDICAL CORPS.

Captain W. A. Sneath, who died of wounds in France last month at the age of 29 years, was son of H. A. Sneath, of Bourne. Educated at Thurlby Elementary School and Grantham Technical Institute, he entered Manchester University in 1905 with two scholarships, and won in succession most of the distinctions open to a medical student, including the Turner medical, the Bradley surgical, and the Agnew scholarship for diseases of children. After demonstrating in anatomy for a year at his own University he held resident posts at the Manchester Royal Infirmary and the Seamen's Hospital, Greenwich, before settling in practice at Ashton-under-Lyne. On the outbreak of war he at once obtained a commission in the R.A.M.C., taking a field ambulance to France, and remaining with the Belgian Army at Calais until March, 1915. Later he was attached to the Durham and Welsh Light Infantry, being mentioned in despatches in May, 1916, and awarded the Military Cross in August of the same year. He had recently been transferred to a field hospital and was fatally wounded the day he returned to it from England.

His Colonel writes of Captain Sneath: "We all admired him for his bravery and his devotion to duty, but loved him for himself." And others testify to the simplicity and singleness of purpose which were associated with his conspicuous brilliance as a student and surgeon.

ARTHUR LINDSAY MAURY CHURCHILL, L.S.A. LOND.,

CAPTAIN, ROYAL ARMY MEDICAL CORPS.

Captain A. L. M. Churchill, who died of pneumonia at Cairo on June 24th, was the eldest surviving son of John Fleming Churchill, Director of Public Works, Ceylon. He was born at Point-de-Galle, Ceylon, educated at Westminster School and Edinburgh University, and was a student at Westminster Hospital Medical School. He was at one time assistant medical officer at Lancaster Asylum, working later at Wonford House, Exeter. In 1909 he settled in general practice at Mevagissey, Cornwall. He joined the Hants R.H.A. in December, 1914, was transferred later to the Hants Carabineers, and went on active service in June, 1916, with a regiment of the London Irish.

Captain Churchill married in 1909 Kate Louisa, second daughter of the late Charles Cousins, who survives him.

EDWARD HYDE OPENSHAW, M.R.C.S., L.R.C.P. LOND.,
TERRITORIAL DECORATION,
LIEUTENANT-COLONEL, SOMERSET LIGHT INFANTRY.

Lieutenant-Colonel E. H. Openshaw, who died recently in India from the effect of a heat wave, was the eldest son of the late Rev. T. W. Openshaw, M.A., a master at the Bristol Grammar School. He received his medical education at the Bristol Medical School, taking the qualification of the Conjoint Board in 1890. After filling a resident post at the Bristol Eye Hospital he joined Mr. R. W. Statham in partnership at Cheddar, Somerset, practising there for more than 20 years. Colonel Openshaw was a keen Volunteer; he held a commission in the old 3rd Somerset Volunteers, becoming major and second in command of the 4th Somersets. At the outbreak of war he was promoted lieutenant-colonel and was sent to India in October, 1914. He was attached to the force that went to the relief of Kut-el-Amara. News of his death has caused keen regret in Cheddar, where he was justly popular, and much sympathy is felt for his widow and son, who is in the Royal Flying Corps.

The names of Fleet-Surgeon W. R. Center, R.N., and Surgeon P. D. Pickles, R.N.V.R., appear in the memorial to the officers and men of H.M.S. *Russell* and *Swiftsure* dedicated this week at St. George's Church, Chatham.

BRITISH PRISONERS OF WAR AND THEIR STUDIES.

Contributions in aid of the British Prisoners of War Book Scheme are urgently needed. In the technical and scientific sections the prisoners' demand for books is very large, but the works asked for are rarely obtainable as gifts, as the owners generally need them for their own use, while second-hand copies sufficiently up-to-date are proving increasingly difficult to procure. In these circumstances the committee are compelled to make large purchases of new copies of up-to-date books of scientific character, and for this ample funds are essential. Donors to the scheme will recognise that their gifts do not merely help to save the prisoners from mental starvation, but also increase their value as a commercial and professional asset after the war. Offers of books (which should always be accompanied by a detailed list) are also invited, and should be addressed to Mr. A. T. Davies, C.B., "Prisoners of War," Board of Education, Victoria and Albert Museum, South Kensington, S.W. 7.

PHOTOGRAPHS FOR THE WAR MUSEUM.

The Committee of the National War Museum is appealing for portrait photographs of all British officers and men who have served, or are at present serving, with the Forces. The photographs should be unmounted to facilitate docketing, and on the back of the photograph should be written the name, regiment or ship, rank, decorations and date, as such information will materially assist the Committee. It is hoped with the coöperation of relations and friends to establish thus a record of permanent value. Photographs should be sent to: The Secretary, National War Museum, H.M. Office of Works, Storey's Gate, Westminster, S.W. 1.

Medical men who respond to this appeal we would ask to send us at the same time a duplicate photograph for our own collection.

IMMUNITY OF HOSPITAL SHIPS.—It is stated that, as a result of representations made by the Spanish Government, Germany has agreed to give a safe conduct to hospital ships, provided that a Spanish naval officer is on board to guarantee that the vessel is used only for the transport of the sick and wounded. Eleven Spanish officers are to be sent to various ports indicated by the Allies.

HOSTELS FOR THE MAIMED.—With the two new hostels for the maimed which Mr. Barnes, the Minister for Pensions, recently opened, at Hanover-street, W., and Phœnix-place, Oxford Circus, respectively, the Eccentric Club have now provided six hostels for the use of limbless sailors and soldiers who are learning a trade to supplement their pensions. One of these two hostels has 35 beds and the other 20. No charge is made for the use of the accommodation, which includes breakfast and the use of a recreation-room. Mr. Barnes said it was more important to the men than a pension that they should be put in the way of becoming self-productive units in civil life. There are in these hostels 1150 maimed men discharged from hospital and learning trades and 50 others will shortly follow.

Correspondence.

"Audi alteram partem."

CREW ACCOMMODATION IN STANDARD SHIPS.

To the Editor of THE LANCET.

SIR,—One hears a great deal of irritation expressed against trade unions. I would like to say a word about the excellent public health work done by one of them.

The conditions of life of seamen have for years and years been very hard, as everyone who knew anything about ships was very well aware. It was up to the shipowners to improve things. Did they? Hardly at all. A few tried a little, were met by the sailors with the suspicion the previous conduct of the shipowning class had naturally engendered, and, not instantly receiving gratitude and appreciation, the owners allowed themselves to fall away from the good intentions they had spasmodically cherished. They left things as they used to be. They neglected the wise opinion of Dr. Collingridge, once medical officer of health, Port of London, and later of the City: "The more comfortable and cleanly forecastles can be kept the more contented and happy men are, the longer they will remain in the ship, and the more work can be got out of them." In the Royal Sanitary Institute, before I retired from the Navy, we tried to get the need of the sailor for decent, dry, clean, airy accommodation put before the public, especially through the mouths of Dr. Howard Jones, of Newport (Mon.), and the late Dr. Herbert Williams, medical officer of health, Port of London, as anyone can see who reads the back numbers of the Institute's Journal. One of Dr. Williams's stories may picture their discomforts. He was coming back from Spain across the Bay, had toothache or something, and was out of action when invited to see one of the crew, down with pneumonia, so he asked another practitioner on board to see the case. He came back and said to Herbert Williams, "What a horrible place that is in which the man is sick!" "My dear sir," said Williams, "that is a forecastle much better than ordinary." So you see the impression produced on a man of trained shore-going experience by what one accustomed to the sea thought good accommodation for sailors. It reminds one of Sir Alfred Keogh on Indian hospitals (Mesopotamia Commission, § 130, i., p. 95).

Seamen latterly have had better quarters, thanks to Mr. Lloyd George and the Merchant Shipping Act of 1906 passed when the Premier was at the Board of Trade. The medical officers of health of port sanitary authorities have done a great deal, too—as much as ever they had power to achieve. But the Seamen's and Firemen's Union have got far greater advances made. We saw lately how enormous is to be the improvement in the crew-spaces of the new standardised ships. Unions are not always wise—not all their orators anyway. There was once a captain who tried to get his men to air their bedding, as is, of course, constantly done in the Navy. They refused, and a union orator advised them to be men and resist this demand on them for overwork! However, lots of stupid things happen and are done, and not only by people of small education. The Seamen's and Firemen's Union has now made itself a power, and that very largely because the shipowners have not taken the trouble to consider what was due to their employees, and have waited to be pushed into obviously necessary improvements which they ought to have anticipated (Mr. Lloyd George's 120 cubic foot per man of the 1906 Act, replacing the 72 cubic feet of the older days, is an example). The owners might have got for themselves the credit for improvements instead of allowing advances to increase the prestige of the union. I once went round a ship with an assistant marine superintendent and showed him a place continuously occupied in which it was scandalous to expect a man to work. His withers were unwrung. "They have never complained, nor has the union," said he complacently. "Is it not your business to find out and improve such things?" said I. He said it was not, nor that of anyone in the company, but he agreed that this attitude was disastrous, because strengthening the union. Besides, the attitude of the companies to their captains' recommendations is

supposed to be that of Surgeon-General Hathaway and General Cowper to Major Carter (Mesopotamia Commission Report, 76, p. 81).

A great deal is said and written against trade unions, but as a profession interested in the conservation of human life medical men must grant that some unions have done much to improve the sanitary conditions of the employment of the work-people, their members, and, in my experience, this credit certainly belongs to the Seamen's and Firemen's Union, and I think the profession should know it. If any one wants to know how shipowners used to treat their men let him read "British Seamen in San Francisco," by Mr. Fell, formerly chaplain to the Missions to Seamen in that port.

I am, Sir, your faithfully,

W. E. HOME,

Farnley, Lymington, August 4th, 1917. Fleet-Surgeon, R.N. (Retd.).

AGGLUTINATION TESTS IN TYPHOID FEVER, ETC.

To the Editor of THE LANCET.

SIR,—In his article under the above title in THE LANCET of July 28th, Captain R. P. Garrow points out (in the course of extended criticism) a misstatement of fact in my reply to his letter which appeared in your issue of Dec. 16th, 1916. Will you allow me to take an early opportunity of acknowledging the error, and of offering an apology to Captain Garrow for its occurrence? I wish to do so at once, since I cannot *immediately* find leisure to take up his numerous inquiries on the general question.

Captain Garrow asked me why in a particular chart I had indicated the probable occurrence of a maximum point of T. agglutinins somewhere between the first two readings recorded. As a first step towards ascertaining what had led me to this view some five or six months previously, I plotted out the readings afresh on a large-scale chart. Subsequently I suggested to Captain Garrow that he should do the same, and stated that on so doing he would find that the curve through the last five points failed to pass through the first. But, as Captain Garrow shows, this statement was wrong. Unfortunately, on plotting out I had inadvertently carried the second reading on to the twenty-second day instead of placing it correctly on the twenty-first day. This mistake threw the curve well above the reading of the seventeenth day, and thus led to my offering Captain Garrow a quite erroneous answer to his inquiry.

I wish now to express my sincere regrets for the error, both to him and to anyone who may have read my reply. Later on I hope to be able to show Captain Garrow that his other criticisms rest upon less secure foundations.

I am, Sir, yours faithfully,

E. W. AINLEY WALKER.

University College, Oxford, August 3rd, 1917.

THE SERVICES.

ROYAL NAVAL MEDICAL SERVICE.

To be temporary Surgeons: H. Robertson, J. P. Fleming, G. Pearson, L. Horsley, F. W. Leech, T. C. Clark, F. R. Law.

ARMY MEDICAL SERVICE.

TERRITORIAL FORCE.

Lieut.-Col. H. D. Brook to be Assistant Director of Medical Services, and to be temporary Colonel whilst so employed.

Capts. W. F. Corfield, J. Chalmers, and K. W. Jones, D.S.O., to be Deputy Assistant Directors of Medical Services.

ROYAL ARMY MEDICAL CORPS.

Lieutenant-Colonels to be temporary Colonels whilst employed as Assistant Directors of Medical Services of a Division: G. G. Delap, D.S.O., G. A. T. Bray.

To be Acting Lieutenant-Colonels: Major M. W. Falkner and Major W. McD. McDowall, whilst in command of a Stationary Hospital. Capt. E. W. Wade whilst in command of a Field Ambulance. Major (Brevet Lieut.-Col.) P. H. Henderson, D.S.O., whilst employed as Assistant Director of Medical Services of a Division. Major J. A. Hartigan, D.S.O., whilst in command of a Casualty Clearing Station.

Temp. Major H. E. Kendall, Canadian A.M.C., to be acting Lieutenant-Colonel whilst in command of Canadian Stationary Hospital.

C. T. Parsons to be temporary Lieutenant-Colonel whilst employed at the Fulham Military Hospital.

Temp. Major R. L. Guthrie (Captain, R.A.M.C., T.F.), having ceased to be employed with the Fulham Military Hospital, relinquishes his temporary commission.

Major W. M. Power is placed on the Half-pay List.

T. M. Martin to be temporary Major.

F. P. Nunneley to be temporary honorary Major.

Temporary Lieutenants to be temporary Captains: L. E. Bolster, C. T. Cheatle, P. G. Russell, C. E. Bartlett, H. J. Bensted, H. B. Jones, P. J. Lydon, J. P. Good, W. McKee, H. C. Nickson, L. M. Rosten, W. Niccol, F. S. Machin, B. Wood-White, A. A. Lees, C. G. Teall, J. L. Gordon, W. J. P. Lillis, C. W. Budden, J. A. Dickson, A. R. Lindsay, C. J. McN. Willoughby, P. A. Sarjeant, L. R. Hill, J. A. Stanley, J. Lindsay, F. H. Cooke, A. W. Ritchie, S. Samuel, G. E. Charters, R. H. Astbury, W. T. Currie, S. G. Scott, W. S. Booth, A. J. Neilan, A. R. Wight, W. L. Millar, F. H. Pickin, A. Cleland, A. J. Caird, J. D. Macfie, H. M. Cade, R. T. G. Aickin, J. B. Mason, A. R. O. Milton, B. T. Parsons-Smith, J. M. Kelly, A. H. Turner, W. Balgarnie, H. G. Smith, A. V. Dill, W. M. Jeffreys, M. Lyons, E. G. D. Murray, D. K. Henderson, J. H. Wilson, P. S. MacLaren, A. H. Turner, M. K. Robertson, P. K. McCowan, P. W. Dove, C. P. Charles, R. C. Crawfurd, P. C. West, T. D. Morgan, H. A. Tillman, J. Butler, J. M. Taylor, C. J. D. Bergin, G. B. Wild, A. W. George, R. H. Smythe, E. H. Morris, H. W. Garden, S. B. Hanbury, J. W. Cowie, F. H. Storey, H. M. Leathes, W. H. Booth, J. C. N. Harris, H. C. Wilson, R. H. Rattray, E. R. Bastard, C. S. O'Neill, H. C. Harper, A. B. Howitt, H. F. Fenton, C. W. Ancrum.

G. F. Laing, Canadian A.M.C., to be temporary Captain.

Officers relinquishing their commissions: Temp. Capts. A. E. Lundon, S. S. Ball, T. O. Hutton, W. J. Grant, W. J. Patterson, E. W. Anderton, G. A. Pringle, R. A. Facey, D. Tenison, T. J. Phillips, A. Hallidie, A. W. Senior, G. H. Simpson, A. C. Sturdy, C. V. Cornish, G. F. Laing, J. Russell, W. S. O. Waring, C. H. Evers, J. E. Long, E. F. Clowes, H. W. Drew, D. F. Shearer, J. D. Harmer, J. Corcoran, G. B. Hillman, J. M. Keegan, T. E. Cottu, J. E. Paterson, E. A. Wilson, A. E. Hutton, A. B. Gordon, J. M. Coates, H. P. Sheppard, T. J. Costello, C. B. Kidd, B. S. Holloway, F. L. Hill, G. S. Coghlan, A. S. Gillett, T. Bell, H. M. Macgill, W. S. Finch, C. G. Monro, J. T. Myles, N. C. Wallis, C. B. Wainwright, N. S. Whitton, C. C. Holman, S. J. Staples, J. McGrath, F. L. Apperly, H. Gray, W. S. Pratt, B. Lyons, J. Kirk, B. B. Metcalfe, R. Craven, C. T. Parsons. Capt. H. S. Smith (on account of ill-health). Temp. Hon. Capt. J. E. MacIlwaine (having resigned his appointment with the St. John Ambulance Brigade Hospital). Temp. Lieuts. R. H. Lee, E. Connell, C. C. Coghlan, P. J. Rooney, C. C. Fissette, A. L. White, F. C. V. Thompson, R. McLaren, J. Sterry.

SPECIAL RESERVE OF OFFICERS.

J. A. Keen (from University of London Contingent, O.T.C.) and C. G. Irwin to be Lieutenants.

TERRITORIAL FORCE.

Lieut.-Col. H. D. Brook is seconded whilst holding an appointment as Assistant Director of Medical Services.

Lieut.-Col. A. W. Mackintosh is seconded for duty with a General Hospital.

Major (temp. Lieut.-Col.) F. D. Boyd, C.M.G., relinquishes his temporary rank on alteration in posting, and is restored to the establishment.

To be acting Lieutenant-Colonels whilst commanding a Field Ambulance: Major J. M. Gover, Major A. D. Ducat, Major A. Callam, Major G. Ashton, and Capt. H. H. B. Cunningham.

Capts. G. S. Haynes and S. W. Curl are seconded for duty with a General Hospital.

Capts. W. F. Corfield, J. Chalmers, and K. W. Jones, D.S.O., are seconded whilst holding appointments as Deputy Assistant Directors of Medical Services.

Capt. (acting Major) T. W. Morcom-Harnels relinquishes his acting rank on ceasing to command a Field Ambulance.

Capt. R. L. Guthrie is restored to the establishment.

Capt. (acting Lieut.-Colonel) O. L. Appleton relinquishes his acting rank on ceasing to command a Field Ambulance.

Lieut. E. S. Simpson to be Captain.

Medical News.

ROYAL COLLEGES OF PHYSICIANS OF LONDON AND SURGEONS OF ENGLAND.—As the result of the Final Examination, held from July 3rd to 20th, the following candidates were approved in the undermentioned subjects, but are not qualified for the diplomas:—

Medicine.—Mary Andrews, Sheffield University; N. Bonard, Geneva; H. S. Bryan, London; A. Bulleid, Guy's; R. Calvo, St. Thomas's; A. Chodak, London; B. S. Collings, University College; O. F. Conoley, London; C. G. Coombs, Guy's; C. G. S. Corner, Madras and University College; J. R. Cox and R. N. Craig, Guy's; H. T. Cubbon, Cambridge and St. Thomas's; E. H. T. Cummings, Liverpool; L. P. de Abrew, London; C. L. Donne, Middlesex; J. C. Gie, Guy's; W. N. Goldschmidt, Cambridge and University College; L. C. Goument, St. Bartholomew's; F. Harrington, Guy's; R. J. Hearn, Cambridge and Guy's; W. S. Herman, London; J. M. Higginton, Cambridge and St. Thomas's; E. C. Hinde, Guy's; S. C. Ho, Cambridge and London; P. G. Horsburgh, St. Bartholomew's; Mary Ethel Illingworth, Liverpool; T. G. James and J. P. J. Jenkins, Cardiff and Westminster; W. A. Jolliffe, St. Bartholomew's; M. H. Jupe, Cambridge and London; N. Kamchorn and J. Kyle, Guy's; J. G. Lawn, Cambridge and St. Thomas's; H. J. Leviseur, Guy's; H. I. Marriner, St. Thomas's; J. Meeussen, Louvain and University College; D. C. Mintzman, King's College; W. P. Nelson, Birmingham; V. S. R. Pandit, St. Bartholomew's; M. J. Panthaky, Bombay and King's College; C. S. Parker, Charing Cross; Irene Grace Parsons, Royal Free; R. W. Payne, Charing Cross; Sybil Madeline Georgina Pratt, Constance Amy Randall, and Joyce Baron Reed, Royal Free; R. I. Rhys, St. Bartholomew's; J. S. L. Roberts, University College; H. B. Russell, St. Thomas's; J. J. Savage, Oxford and St. Bartholomew's; Charlotte Annie Shields, Royal Free; H. H. Silley, University College; H. G. Taylor, Cambridge and St. George's; O. S. Thompson, Cambridge and St. Thomas's; and A. W. Wells, London.

Midwifery.—A. Abelson and G. V. W. Anderson, University College; Mary Andrews, Sheffield; B. F. Armitage, Cambridge and

St. Bartholomew's; M. Baranov, University College; C. C. Beney, London; A. Blackstock, King's College; J. C. Blake, University College; E. J. S. Bonnett, St. Thomas's; J. S. Boruchowitz, University College; H. W. Breese, Middlesex; Eleanor Marjorie Burnett, Royal Free; F. Caldecott, Guy's; J. D'A. Champney, Bristol; A. Chodak, London; W. B. Christopherson, St. Bartholomew's; W. A. Clements, Birmingham; B. S. Cornell, Toronto; J. R. Cox, Guy's; Joyce Emily Craggs, St. Mary's; R. N. Craig, Durham and Guy's; E. H. T. Cummings, Liverpool University; I. de B. Daly and W. L. Dandridge, Cambridge and St. Bartholomew's; H. Das, University College; J. Datta, Calcuta Medical College; T. Davies, University College, A. R. Doyle, Guy's; F. N. V. Dyer, Cambridge and St. Thomas's; D. C. Farquharson, St. Mary's; W. Feldman, University College; T. Fernandez, Guy's; E. T. D. Fletcher, St. Bartholomew's; W. A. Flynn, Guy's; Lucie Gainsford, Charing Cross; S. V. Goldhurst, Cambridge and London; W. N. Goldschmidt, Cambridge and University College; W. Gover and W. H. Grace, Guy's; R. B. Green, University College; N. B. de M. Greenstreet, Cambridge and St. Thomas's; W. S. Gross, Cambridge and St. George's; Magdalena Hilda August Hamel, St. Mary's; W. A. Hawes, Guy's; S. N. Hayes, Middlesex; W. M. Heald, Cambridge and St. Bartholomew's; H. W. Hill, Cambridge and Middlesex; R. Hilliard, London; R. M. Humphreys, St. Thomas's; M. Ibrahim, Middlesex; Mary Ethel Illingworth, Liverpool; C. V. Isard, St. Thomas's; W. A. Jackman, Bristol; A. B. Jackson, Toronto; E. H. Johnson, Manchester; H. Johnson, Guy's; M. E. Jones, St. Thomas's; M. H. Jupe, Cambridge and London; N. E. F. Kemm, Bristol; A. E. A. Khair, St. Bartholomew's; D. M Lala, King's College; A. W. Lloyd-Davies, Birmingham; H. O. Long, Guy's; J. G. McCann, St. Thomas's; Cecily Margaret Evadne Maude, Royal Free; J. Meeussen, Louvain and University College; P. M. Neighbour, Cambridge and St. George's; Edith Marjorie Newman, Royal Free; E. Nissim, University College; A. Othman, St. Thomas's; W. G. Owen, London; R. H. Parry, Middlesex; A. L. S. Payne, Guy's; A. W. Peeris, University College; R. J. Perkins, St. Bartholomew's; G. A. Petrie, Manitoba; A. R. Poduval, Madras and St. Bartholomew's; M. C. Polhill, University College; Sybil Madeline Georgina Pratt, Royal Free; E. F. Rabey, Middlesex; F. N. Reynolds, St. Thomas's; Florence Mildred Rhodes, Royal Free; R. T. F. D. Roberts, Guy's; H. T. Rymer, King's College; R. J. Saunders, London; C. K. Scales, King's College; Eleanor May Scarborough, Royal Free; M. L. Schroeter, Zürich; J. A. A. P. Scott, London; A. G. M. Severn and G. A. S. Shacklock, Guy's; B. B. Sharp, St. Bartholomew's; B. L. Slater, London; R. C. W. Staley, Guy's; G. K. Stone, St. Bartholomew's; R. H. Sunderland, London; H. G. Taylor, Cambridge and St. George's; H. B. Troup, London; W. S. Tunbridge, Oxford and St. Bartholomew's; M. D. Vint, Cambridge and London; F. F. Wheeler, St. Mary's; and E. Wolff, University College.

Surgery.—G. E. Birkett, Cambridge and Manchester; P. F. Bishop, Cambridge and St. Thomas's; Geoffrey Bourne, St. Bartholomew's; J. W. Brash, St. Mary's; Francis Caldecott, Guy's; C. B. Cohen, Cambridge and St. Thomas's; Ruth Eden Conway, Manchester; G. W. Coombes, London; D. R. Curnock, Charing Cross; L. S. Debenham, Guy's; C. Depla and W. Feldman, University College; E. T. D. Fletcher, St. Bartholomew's; D. M. Muir, Cambridge and St. Bartholomew's; D. F. Panton, London; T. M. Payne, St. Bartholomew's; H. Round, Birmingham; S. C. Shaw, Middlesex; and C. E. A. Shepherd, St. George's.

UNIVERSITY OF LONDON.—At examinations for internal and external students held recently the following candidates were successful:—

SECOND EXAMINATION FOR MEDICAL DEGREES, PART I.

Thomas Adam, St. Bartholomew's Hospital; Frances Dacre Alexander and Eleanor Mary Ashmall, London School of Medicine for Women; Frederick Bach, London Hospital; Gladys Lieba Buckley, Girton College; Dora Mahalah Cadman, London School of Medicine for Women; Antoine Yves Cantin, London Hospital; Linda Catmur and Dorothy Spencer Chamberlain, London School of Medicine for Women; Florence Ruth Clulow, Newnham College; Ivy Collier, London School of Medicine for Women; Rustam Nusserwanji Cooper, University College; Kenneth James Herbert Davies, Guy's Hospital; Sidney Davies, University College, Cardiff; Grace Mary Denham, London School of Medicine for Women; Conor John Donelan, St. Bartholomew's Hospital; Hilda Ray Dutton, University College, Exeter; Gertrude Rose Stewart Ericson and Gertrude Evans, London School of Medicine for Women; Olive Gwendolin Fisk, Girton College; Ena Dorothy Foster, London School of Medicine for Women; Mark Garden, London Hospital; Geraldine Norah Geary, Marie Louise Pauline Goetze, and Marjorie Pearl Christine Greene, London School of Medicine for Women; Stanley Allwright Gunter, St. Bartholomew's Hospital; Muriel Minnie Harris, Elizabeth Merriman Heath, Florence Reed Hodges, and Marjorie Browning Hubert, London School of Medicine for Women; Marjorie Mary Jefferson, Victoria University of Manchester; *Leslie Middlemiss Jennings, St. Bartholomew's Hospital; Winifred Angela Fanny Kann, Irene Esther Kenworthy, and Bessie Levin, London School of Medicine for Women; Anna Gwenllian Mary Lewis, University College, Cardiff; Denzil Haydn Lewis, St. Mary's Hospital; *Muriel Jessie Lough, Henrietta Alexandrina Clark Main and Dora Mason, London School of Medicine for Women; Amin Mikhail, King's College; Emily Marjorie Milnes, London School of Medicine for Women; Shafik Fahmy Mina, University College; *Sybil Grace Mocatta, London School of Medicine for Women; Leslie Stuart Morgan and Christopher Wesley Narbeth, St. Bartholomew's Hospital; Thomas Stanley North, St. Mary's Hospital; Doris Maude Odlum, Winifred Catherine Piggott, Mary Winifred Pitt-Lewis, and Beatrice Myrtilla Powell, London School of Medicine for Women; Edith Margaret Ross-Johnson, Newnham College; Hilda Marjorie Stebbing Russell, London School of Medicine for Women; Effie Frederike Amelia Samter, Victoria University of Manchester; Ena Mildred Sansom, London School of Medicine for Women; Charles Isaac Schiff, London Hospital; Margaret Scott-Moncrieff, London School of Medicine for Women; Alfred Senn, London Hospital; Leonard Smalley, St. Thomas's Hospital; Arthur Cleve Damian Telfer, St. Bartholomew's Hospital; Wenefride Thompson, Helen Caroline Tompson, and Edith Helen Trimmer, London School of Medicine for Women; Eileen Maud Turner, Girton College; Wm. Gilbert Desmond Harold Urwick, St. Bartholomew's Hospital; Mildred Warde, Victoria University of Manchester; Estlin Hugh Weatherall, St. Bartholomew's Hospital; Leslie Ralph Augustus Wells, Guy's Hospital; Trevor Morgan Raleigh Williams, University College; and Constance Muriel Willis, London School of Medicine for Women.

* Awarded a mark of distinction.

N.B.—This list, published for the convenience of candidates, is issued subject to its approval by the Senate.

TRINITY COLLEGE, DUBLIN: SCHOOL OF PHYSIC.—At examinations held recently the following candidates were successful:—

INTERMEDIATE MEDICAL EXAMINATION, PART I.

Anatomy, Physiology, and Organic Chemistry.—Eric Henry Cooke Allen, Adrian Jonannes Louw Snyman, Janie Millar Cummins, Robert Mulhall Corbett, William Bernard Pemberton and Maurice Nurock (equal), Eileen Hilda Dowse, James Alexander Smith, Victor Dowse, Robert Dormer, Eric Richard Murray, Doris Louisa Graham, Charles John Shortt, Thomas Donald Gordon, Lawrence Brock, William Burton Fox, James Joseph Patrick Kelly, William James Alexander Russell, Percival Israel Levitt, William Randolph Macnie, Moira Mary Brown, Elsie Anna Burns, Olive Baile, Johannes Marthinus Benjamin De Wet, Isaac Levy, Patrick Joseph Healy, Mervyn McBrien, Joseph Ballantyne Maguire, and Johannes Cornelis Coetzee (omitting Organic Chemistry).

FINAL MEDICAL EXAMINATION, PART I.

Medical Jurisprudence and Hygiene, Materia Medica and Therapeutics, Pathology.—Victor Millington Synge, William Frederick McConnell, Louis John Partrick Murphy, William Philip Elford, Alewyn Johannes Vorster, Ethel Marjorie Luce, Frederick William Godbey, Daniel McElwee, Becker FitzJames Haythornthwaite, Gertrude Rice, Robert Bevan Nangle Smartt, Francis John Gerrard Batterby (Pathology completing examination), and John William Scharff (Materia Medica and Therapeutics, Medical Jurisprudence and Hygiene).

FINAL MEDICAL EXAMINATION, PART II.

Medicine (M.B.).—Bryan Austin McSwiney, George William Bernard Shaw, Harry Banks, Andrew Hope Davidson and Patrick Rock (equal), William Joseph Hamilton, Henry James Rice, Hirsh Brill, and William Leech Young.

Surgery (B.Ch.).—Edward D'Arcy McCrea, Alexander Richard Barlas, Willem Petrus Lubbe and Hastings Harley Molloy (equal), James Roland Brennan, Michiel Christoffel Dippenaar, Sidney Alfred Clark, Charles Percival Chambers, Andrew Hope Davidson, Fleetwood William Porter Sullivan, John James Keatley and John Benson McGranahan (equal), Meta Grace Jackson, Alan Glynn Wright, and William Joseph Hamilton and Percy Crowe Parr (equal).

Midwifery (B.A.O.).—Patrick Rock, George William Bernard Shaw, Charles Going Ambrose, Robert Wallace Nesbitt, Frederick Gill, Percival Atkin Dormer, Thomas Mulock Bentley, Hirsh Brill, John Edmund Hill, Charles Percival Chambers, and Gilbert Marshall.

FINAL DENTAL EXAMINATION (B. DENT. SC).

Henry Erasmus Flavelle.

M.CH. EXAMINATION.

Herbert de Lisle Crawford.

M.A.O. EXAMINATION.

Mabel Alice Dobbin Crawford.

The following medals, prize, and scholarships were awarded:—John Mallet Purser medal (Physiology), Janie Millar Cummins; Daniel John Cunningham Memorial medal and prize (Anatomy), Eric Henry Cooke Allen; Medical scholarship (Anatomy and Physiology), John Henry Coolican; Stewart scholarship (Anatomy and Physiology), Noelle Long; Fitz-Patrick scholarship, Edward D'Arcy M'Crea.

ROYAL COLLEGE OF SURGEONS IN IRELAND.—At a special meeting of the President, Vice-President, and Council, Lieutenant-Colonel William Taylor, President, in the chair, Major Francis Carmichael Purser, M.D. Dub., F.R.C.P.I., was unanimously elected Professor of the Theory and Practice of Physic in the Schools of Surgery.

DONATIONS AND BEQUESTS.—The late Mr. Walter Abbott Paynter, of Knowle Green, Staines, left by will £2000 towards a cottage hospital at Staines and £1000 to the Royal Hospital for Incurables.

THE LATE DR. SELWYN HARVEY.—With the death of Dr. John Stephenson Selwyn Harvey there disappears a family physician of the old school. Educated at Guy's Hospital, to which institution he was greatly attached, Dr. Harvey took the Membership of the Royal College of Surgeons of England in 1863. He practised for many years in Boulogne before coming to London in 1890, when he settled in Kensington, and continued in active work until quite recently. Of equable temperament, despite the cares inseparable from a large practice, he was especially marked by readiness to assist younger practitioners, whether by advice or by handing on of work. He was a man of cultivated taste and varied interests, and will be missed by a large circle.

Parliamentary Intelligence.

NOTES ON CURRENT TOPICS.

Select Committee on Medical Examinations.

THE Select Committee of the House of Commons which is inquiring into the medical examinations and re-examinations for the Army, particularly in relation to the Military Service (Review of Exceptions) Act, 1917, has presented a Special Report.

The Committee held a public sitting on Thursday, August 2nd, Mr. SHORTT being in the chair.

Surgeon-General JULIAN, of the Western Command, was the only witness. He said that he had only recently taken up his present appointment. He spoke as to certain complaints of want of privacy in the medical examinations, but that had been changed. Screens were used and every privacy was secured. As to the statements about the destruction of men's papers, it was an unheard-of thing for a medical board to destroy a man's discharge papers, and it was possible that some confusion had arisen between the classification papers and the medical papers.

Answering Mr. SUTTON, Surgeon-General JULIAN stated that he had visited Hulme Town Hall as recently as the end of July, where he found the place well provided with screens. So far as he could see, the medical board there was working satisfactorily and doing its best.

In reply to Mr. NIELD, Surgeon-General JULIAN said that men such as dyspeptics could now be classified under C 3 for working under domestic conditions.

Mr. PRINGLE: Does that mean that the man may stay in his own home and work, say, in a pay office?

Surgeon-General JULIAN: Yes; I should think so. We are also requested to say if a man is fit to follow his own trade. Those are to be special entries.

Mr. NIELD: Then our labours have not been in vain.

The CHAIRMAN intimated that the Committee expected to lay a Special Report on the table of the House of Commons that evening. The arrangements regarding the Committee's further inquiries would be intimated later.

The Special Report.

The Special Report of the Committee was duly laid and published. After reviewing the course of the inquiries the report concludes:—

> The Committee recommend that the whole organisation of recruiting medical boards and of the medical examinations and re-examinations should be removed from the War Office and placed under civilian control.
>
> In order to restore public confidence pending action on the foregoing recommendation, the Committee further recommend: (1) That all men waiting to be called up for military service, or holding a certificate of temporary or conditional exemption, may appeal to an appeal tribunal, and such tribunal, if it thinks fit, may order a re-examination of such men by a medical or special medical board; (2) that all attested men should have the same rights of appeal as unattested men; (3) that all men who have been called up since April 5th, 1917, and are still in the United Kingdom, should have the right to appear before, and be examined by, an invaliding medical board.

Adopting Lord Derby's Proposals.

The question of adopting the recommendations of the Select Committee is receiving close attention. In the House of Commons on Tuesday, August 7th, Sir MAURICE LEVY asked whether any steps had been taken to give effect to the proposals which Lord Derby had announced his readiness to accept. Mr. BONAR LAW stated that if the reference was to certain promises made by the Secretary for War to the Select Committee, he was informed that orders to give effect to them had already been issued, the Army Council Instructions in which they were embodied having previously been shown to the chairman of the committee, and by him to the committee, to whom the proposals commended themselves as carrying out the pledge. The larger question of the transfer of the responsibility for recruiting had been before the War Cabinet, who had accepted the change in principle. The details had still to be determined.

Public Health (Prevention and Treatment of Disease) (Ireland) Bill.

The Public Health (Prevention and Treatment of Diseases (Ireland) Bill has been read a third time in the House of Commons.

Experiments on Living Animals.

A return has been presented to Parliament showing the number of experiments on living animals during the year 1916 under licences. The report of Professor G. D. THANE states that the number of persons who held licences in England and Scotland during the year was 651, but 352 licensees performed no experiments. An appended table contains the number of licensees who returned experiments. It is divided into two parts, (A.) and (B.), for the purpose of separating experiments which were performed without anæsthetics from experiments in which anæsthetics were used. The total number of experiments included in Table (A.) is 1748. Of these there were performed—

Under licence alone	829
,, Certificate C.	151
,, Certificate B.	542
,, Certificate B. + EE.	226

Table (B.) is devoted entirely to inoculations, hypodermic injections, and some few other proceedings, performed without anæsthetics. It includes 64,295 experiments, whereof there were performed—

Under Certificate A.	63,656
,, Certificate A. + E.	612
,, Certificate A. + F.	27

The total number of experiments is 66,043, being 4530 less than in 1915; the number of experiments included in Table (A.) shows a decrease of 1023, and that in Table (B.) a decrease of 3507. The returns show that during the year 1916, 7624 experiments were performed by eight licensees in the course of cancer investigations. 214 are in Table (A.) and 7410 in Table (B.). The latter are almost entirely inoculations into mice. 126 licensees report over 20,000 experiments which were performed for Government Departments, County Councils, Municipal Corporations, or other Public Health Authorities. Twenty licensees report over 28,000 experiments for the preparation and testing of antitoxic sera and vaccines, and for the testing and standardising of drugs.

Dr. R. F. TOBIN reports that in Ireland the number of persons holding licences at the end of 1916 was 20. It is further stated that 580 experiments were performed by 16 licensees, 63 being under licence alone and 517 under certificate. 485 were simple inoculations under Certificate A. In 85 cases the object of the research was physiological, in 93 the object was pathological, and 402 had a therapeutic aim. Dr. TOBIN has every reason to believe that the holders of licences have obeyed the spirit as well as the letter of the Act, and that experiments have not been unnecessarily multiplied.

HOUSE OF COMMONS.

WEDNESDAY, AUGUST 1ST.

A Ministry of Health.

Major CHAPPLE asked the Chancellor of the Exchequer whether the Government would set up a Commission charged with the duty of consolidating all existing laws affecting questions of public health, in anticipation of the establishment of a Ministry of Health.—Mr. BONAR LAW replied: The Government do not consider that any advantage would be derived from setting up such a Commission.

Sir W. COLLINS: May I ask whether the Government has decided to establish a Ministry of Health?—Mr. BONAR LAW: No, Sir, and for that reason we thought it would be desirable that the first step should be taken before the second.

The Mesopotamia Commission.

Mr. KING asked the Under Secretary for War whether the officers blamed in the report of the Commission on Mesopotamia would be tried by court-martial; if so, whether the charges had yet been formulated, what those charges were, and whether the trials would take place in this country and be open to the public.—Mr. MACPHERSON answered: The Army Council has called upon the officers subject to its jurisdiction to furnish written explanations of the statements contained in this report relating to their conduct of their official duties. On receipt of those explanations the Council will consider what further action should be taken.

THURSDAY, AUGUST 2ND.

Unregistered Dentists.

Answering a long series of questions bearing on the appointment of a Departmental Committee to investigate unregistered dental practice, and suggesting that representation should be given on it to unregistered dentists, Mr. BONAR LAW (the Chancellor of the Exchequer) said: It is not the case that the Committee referred to is confined mainly to medical men and qualified dentists. There are only four such persons out of the eight composing the Committee, and of these only one is in practice. No legislation is proposed, but the Committee, which contains a Member of each House of Parliament, is asked to consider the propriety of proposing it. The greatest care will be taken to obtain the evidence of unqualified dentists through such recognised channels as are available. The war has brought the scarcity of qualified dentists into prominence and the object of the appointment of the Committee at the present time is to prepare the way for legislation if desirable, on the return of peace. I will circulate the terms of reference to the Committee.

Mr. RAFFAN: Is it not reasonable that unregistered dental practitioners who are so vitally affected should be represented as well as medical men and registered dentists?—Mr.

BONAR LAW: I can add nothing to the answer which I have already given. There is only one medical man who by any possibility could be supposed to be personally interested.

The following are the terms of reference to the Departmental Committee circulated by the Chancellor of the Exchequer:—

The Lord President of the Council has appointed a Departmental Committee to investigate the extent and gravity of the evils connected with the practice of dentistry and dental surgery by persons not qualified under the Dentists Act and to consider and report upon—

(1) The causes of the present inadequate supply of qualified dentists and dental surgeons;

(2) The expediency of legislation prohibiting in the United Kingdom the practice of dentistry and dental surgery by unqualified persons, and in the event of such legislation being deemed expedient the conditions under which certain classes of unqualified persons at present engaged in the practice of dentistry might be permitted to continue in practice by the institution of a special roll for the purpose;

(3) The practicability, without impairing the existing guarantees for the efficient practice of dentistry, of (*a*) modifying the course of study and examination prescribed for dental qualifications; (*b*) reducing the time occupied; (*c*) diminishing the cost of training dental students.

The chairman of the Committee is the Right Hon. Francis Acland, M.P., and the members are Viscount Knutsford, Sir Almeric Fitzroy, K.C.B., K.C.V.O., clerk of the Council; Sir Arthur Newsholme, K.C.B., medical officer of the Local Government Board; Sir George Newman, chief medical officer of the Board of Education; Mr. Charles Sissmore Tomes, F.R.S.; Mr. William Henry Dolamore, L.D.S.; and Mr. George P. Blizard, with Mr. F. H. O. Jerram as secretary.

Mr. YEO asked the Under Secretary for the Home Department whether it was proposed to adopt the recommendations of the Departmental Committee which investigated the question of the use of cocaine by unregistered practitioners in dentistry.—Mr. BRACE wrote in reply: I propose to defer the carrying out of the recommendations in question, which would involve setting up machinery for the registration of unqualified persons practising dentistry, pending the inquiry of the Departmental Committee.

Organisation of the Royal Army Medical Corps.

Major DAVID DAVIES asked the Under Secretary for War whether, in view of the shortage of doctors to meet the civil requirements of the nation, he would institute an inquiry into the administration and organisation of the Royal Army Medical Corps, in order to ascertain whether the services of medical officers who had joined the Army were utilised to the fullest extent.—Mr. MACPHERSON replied: The Army Council are fully alive to the shortage of medical officers, and are watchful that the fullest use is made of all medical officers employed by the Army, but it is not proposed to institute at the moment any inquiry while active operations are in progress which might dislocate and militate against the effective administration of the forces in the field.

Major DAVIES: Does the War Office intend to do anything?—Mr. MACPHERSON: The business of the War Office is to consider the demand made by the Higher Command.

Mr. PRINGLE: Has a Departmental Committee considered the extent to which the services of medical practitioners now in the Army are being utilised?—Mr. MACPHERSON: No, but my information is that the officers of the Higher Command are satisfied that there are none of the medical practitioners who are not being used in the best way.

Mr. PRINGLE: The question is whether all of them are being utilised in the best way.

Sir G. THOMAS: Is the honourable gentleman aware that civilian medical practitioners who joined the Army 12 or 18 months ago and have been abroad have only done real medical work for a few hours during the whole of that long period?—Mr. MACPHERSON: I do not know where my honourable friend gets his facts.

Mr. PRINGLE: But they are true.

Mr. MACPHERSON: But I am glad in a way that doctors are largely unemployed at the front. It shows that casualties are few. At the same time at any given moment the casualties may be very severe and very numerous.

Mr. PRINGLE: Is my honourable friend not aware that a large part of the time of these medical men is taken up with work which is not medical, and which could be done by laymen who have had no medical experience?—Mr. MACPHERSON did not reply.

Major DAVIES asked whether, in view of the responsibility devolving upon the Director-General of the Army Medical Service for the health and sanitation of the British armies, the time had arrived when this branch of the War Office should no longer form part of the Adjutant-General's department, but should be given the status of a separate department of the War Office, whose responsible head should be a member of the Army Council.—Mr. MACPHERSON wrote in reply: The Secretary of State for War considered the question some time ago, and decided that the present was not an opportune moment at which to reopen discussion on a matter of organisation of this importance which had been decided some years ago, after the fullest investigation of all the relevant arguments. With that decision, moreover, he is still in the fullest agreement.

Major DAVIES asked whether in the organisation of the Royal Army Medical Corps a certain number of fully qualified medical men were employed to supervise the mechanical and horse transport of the ambulance and other Royal Army Medical Corps units at the front; and whether, in view of the shortage of civilian doctors, he would take steps to allocate this particular work to officers who were not qualified medical practitioners.—Mr. MACPHERSON in a written answer replied: In all motor ambulance convoys there is attached an officer of the Army Service Corps, whose duties are to look after the mechanical transport, but an officer of the Royal Army Medical Corps is necessarily in command of this as of all other medical units for the care of the wounded. In the case of field ambulances a warrant officer of the Army Service Corps is attached to superintend the motor ambulance and horsed wagons.

MONDAY, AUGUST 6TH.

Territorial Medical Officers.

General CROFT asked the Under Secretary for War whether his attention had been called to the fact that Territorial medical officers who were in the force prior to the war had been repeatedly passed over for temporary promotion by others who were juniors in length of service, who had not served abroad and presumably had not the same experience in war surgery, were not on the staff of any recognised hospital before the war, and had none of the higher surgical diplomas; whether his attention had been called to the fact that Territorial officers were actually in charge of surgical divisions with officers of superior rank under their charge; and whether he could see his way to undertake to alter this state of affairs.—Mr. MACPHERSON wrote in reply: The matters referred to in the first part of the question are under the consideration of the Churchill Committee, and the Report on Royal Army Medical Corps, Territorial Force, is expected shortly. It may happen that the officer in charge of a surgical division is junior to other officers of the division. He would be placed there on account of his capacity as a surgeon.

TUESDAY, AUGUST 7TH.

The Organisation of the Royal Army Medical Corps.

Major DAVID DAVIES asked the Under Secretary for War whether his attention had been called to the fact that there was no Department responsible for the provision of doctors to meet the medical requirements of the civilian population; whether he was aware that the War Office had called up civilian doctors irrespective of civilian needs; that, owing to the defective organisation of the Royal Army Medical Corps, the services of doctors who had joined the Army were not utilised to the fullest extent; and whether he would appoint a competent authority to adjudicate between the competing claims of the Royal Army Medical Corps and the civilian population, as had already been done in the case of agriculture.—Mr. MACPHERSON answered: There is a committee appointed for this purpose under the Military Service Act, which is the competent authority under that Act. I think my honourable and gallant friend is under a misapprehension in supposing that the War Office calls up doctors irrespective of civil needs, or that the fullest and best use is not made of the doctors serving on the various fronts.

Lieutenant-Colonel R. M. Carter.

Mr. GILBERT asked the Secretary for India what was the present position of Major R. M. Carter, Indian Medical Service; was he still on service in India or was he still detained in this country; if the latter, whether it made any difference in his pay and allowances, and, if so, to what extent; and whether, in view of the praise of this officer's action by the Mesopotamia Report, he proposed that he should be promoted or given any special recognition in view of his services to the British and Indian troops.—Mr. MONTAGU replied: Lieut.-Col. Carter is at present employed under the Admiralty on the equipment of hospital ships. Under Indian regulations an officer placed on special duty in this country draws somewhat less than the full pay of his substantive appointment in India. Lieut.-Col. Carter's deputation pay—£1057 10*s.* a year—is accordingly less than that attached to the last appointment which he held in India—viz., £1360 a year. The answer to the last part of the question is in the affirmative, and I am in communication with the Government of India on the subject.

WEDNESDAY, AUGUST 8TH.

Organisation of the Royal Army Medical Corps.

Major DAVID DAVIES asked the Under Secretary of State for War whether the Secretary of State for War was aware of the fact that at the Representative Meeting of the British Medical Association (representing 18,000 doctors) on July 26th a resolution was passed urging the Council of the Association to press for an inquiry into the administration of the

Army Medical Service; and would he say if it was proposed to adopt this suggestion.—Mr. MACPHERSON replied: I understand that evidence was given by this Association as well as others before the committee presided over by Mr. Churchill. It would not be conducive to the efficiency of the service or the successful prosecution of the war to initiate such an inquiry as is suggested while the war is in progress. The Secretary of State some little time ago arranged for certain eminent medical men to visit France for the purpose of satisfying himself that the medical services were on a sound and efficient basis. The visit of the committee will take place when the operations now in progress admit of their carrying out useful inquiries.

Appointments.

Successful applicants for vacancies, Secretaries of Public Institutions, and others possessing information suitable for this column, are invited to forward to THE LANCET *Office, directed to the Sub-Editor, not later than 9 o'clock on the Thursday morning of each week, such information for gratuitous publication.*

BUTLER, L. H., M.B., Ch.B. Leeds, has been appointed Certifying Surgeon, under the Factory and Workshop Acts, for the Castleford District of the county of Yorks (West Riding).

MAYNE, CHRISTINA A., M.B., Ch.B. Edin., Temporary Tuberculosis Medical Officer for the county of Aberdeen.

MILLIGAN, E. H. M., M.D. Belf., School Medical Officer for Bath.

Vacancies.

For further information regarding each vacancy reference should be made to the advertisement (see Index).

When the application of a Belgian medical man would be considered the advertisers are requested to communicate with the Editor.

BARNSLEY, BECKETT HOSPITAL.—Two Female House Surgeons. Salary as arranged, with board, &c.

BATH, WINSLEY SANATORIUM FOR CONSUMPTION.—Assistant Resident Medical Officer, unmarried. Salary £250 per annum, with board, &c.

BEDFORD COUNTY HOSPITAL.—House Physician, unmarried. Salary £150 per annum, with board, &c.

BOURNEMOUTH, ROYAL VICTORIA AND WEST HANTS HOSPITAL.—Resident Medical Officer. Salary £300 per annum, with board, &c.

BRADFORD CITY.—Temporary Assistant School Medical Officer. Salary 8 guineas per week.

BRISTOL ROYAL INFIRMARY.—House Physician and House Surgeon. Salary at rate of £120 per annum, with board, &c.

BURSLEM, HAYWOOD HOSPITAL.—Female Resident Medical Officer. Salary £300 per annum, with board, &c.

CAMBRIDGE, ADDENBROOKE'S HOSPITAL.—House Physician. Salary £150 per annum, with board, &c.

CHARING CROSS HOSPITAL.—Resident House Physician. Also House Surgeon. Salaries at rate of £100 per annum.

CHELTENHAM EYE, EAR, AND THROAT FREE HOSPITAL.—Honorary Surgeon.

DERBY, DERBYSHIRE ROYAL INFIRMARY.—House Surgeon. Salary £200 per annum, with board, &c.

DURHAM COUNTY HOSPITAL.—House Surgeon. Salary and bonus at rate of £180 per annum, with board, &c.

FOLKESTONE, ROYAL VICTORIA HOSPITAL.—Resident Medical Officer. Salary £200 per annum, with board, &c.

GREAT YARMOUTH GENERAL HOSPITAL.—House Surgeon, unmarried. Salary £200 per annum, with board, &c.

HAMPSTEAD GENERAL AND NORTH-WEST LONDON HOSPITAL, Haverstock Hill, N.W.—House Physician for six months. Salary at rate of £200 per annum, with usual allowances.

HOSPITAL FOR CONSUMPTION AND DISEASES OF THE CHEST, Brompton.—House Physician for six months. Salary 30 guineas.

IPSWICH, EAST SUFFOLK AND IPSWICH HOSPITAL.—Female Resident. Also Two House Surgeons.

LEICESTER ROYAL INFIRMARY.—House Surgeon. Salary £250 per annum, with board, &c.

LINDSEY (LINCOLNSHIRE) COUNTY OF THE PARTS OF.—Female Assistant Medical Officer of Health. Salary £400 per annum, with travelling expenses.

LIVERPOOL EYE AND EAR INFIRMARY, Myrtle-street.—Female House Surgeon.

MACEDONIA, SCOTTISH WOMEN'S HOSPITALS.—Female Junior Medical Officer. Salary £300 per annum, with uniform, board, and travelling expenses.

MAIDSTONE, WEST KENT GENERAL HOSPITAL.—House Surgeon, unmarried. Salary £250 per annum, with board, &c. Also Assistant House Surgeon. Salary £125 per annum, with board, &c.

MANCHESTER, HULME DISPENSARY, Dale-street, Stretford-road.—House Surgeon. Salary £250 per annum, with apartments, &c.

MANCHESTER, ST. MARY'S HOSPITALS.—Honorary Pathologist.

NETLEY, BRITISH RED CROSS HOSPITAL.—Medical Officer.

OXFORD UNIVERSITY, DEPARTMENT OF HUMAN ANATOMY.—Female Assistant Demonstrator of Anatomy. Salary £150 per annum.

QUEEN CHARLOTTE'S LYING-IN HOSPITAL, Marylebone-road, N.W.—District Resident Medical Officer for four months. Salary at rate of £60 per annum, with board, &c.

QUEEN MARY'S HOSPITAL FOR THE EAST END.—House Surgeon.

READING, BERKSHIRE EDUCATION COMMITTEE.—Assistant Medical Inspector of Schools. Salary £400 per annum, &c.

ROCHESTER, ST. BARTHOLOMEW'S HOSPITAL.—Junior Resident House Surgeon. Salary at rate of £150 per annum, with board, &c.

SALFORD ROYAL HOSPITAL.—Junior House Surgeon. Salary at rate of £150 per annum, with board, &c.

SALFORD UNION INFIRMARY, Hope, Pendleton, near Manchester.—Female Assistant Resident Medical Officer. Salary £250 per annum, with rations, &c.

SALISBURY GENERAL INFIRMARY.—House Surgeon. Salary £150 per annum, with board, &c.

SHEFFIELD, JESSOP HOSPITAL FOR WOMEN, GYNÆCOLOGICAL AND MATERNITY DEPARTMENTS.—Senior Female House Surgeon, unmarried. Salary £300 per annum, with board, &c.

SHEFFIELD ROYAL INFIRMARY.—Two House Surgeons. Salary £120 per annum, with board, &c.

STAFFORDSHIRE EDUCATION COMMITTEE.—Female Assistant School Medical Inspectors. Salaries at rate of £400 per annum.

STOKE-ON-TRENT COUNTY BOROUGH.—Female Assistant Medical Officer. Salary £350 per annum.

SWANSEA EDUCATION COMMITTEE.—Female Assistant School Medical Officer. Salary £350 per annum.

VENTNOR, ISLE OF WIGHT, ROYAL NATIONAL HOSPITAL FOR CONSUMPTION.—Locum Tenens Assistant Medical Officer for three months. Salary at rate of £5 per week, with board, &c.

WOLVERHAMPTON AND MIDLAND COUNTIES EYE INFIRMARY.—House Surgeon. Salary £150 per annum, with board, &c.

WOLVERHAMPTON UNION WORKHOUSE.—Assistant Resident Medical Officer and Medical Officer of Cottage Homes. Salary £300 per annum, with rations, &c.

THE Chief Inspector of Factories, Home Office, London, S.W., gives notice of a vacancy for a Certifying Surgeon under the Factory and Workshop Acts at Ebbw Vale, in the county of Monmouth.

Births, Marriages, and Deaths.

BIRTHS.

BLAKEWAY.—On August 7th, at Weymouth-street, W., the wife of Harry Blakeway, M.S., F.R.C.S., of a son.

ELLIS.—On August 5th, at Naval-terrace, Sheerness, the wife of Surgeon G. E. D. Ellis, R.N., of a daughter.

KAYE.—On August 2nd, at Seabreeze, Netley Abbey, the wife of Captain H. W. Kaye, R.A.M.C., of a son.

SPROULE.—On July 30th, at Woodside Nursing Home, Plymouth, the wife of Captain J. C. Sproule, R.A.M.C., of a daughter.

WORTHINGTON.—On August 3rd, at Clanricarde-gardens, the wife of Lieutenant-Colonel Frank Worthington, D.S.O., R.A.M.C., of a son.

MARRIAGES.

DOUGLAS-MORRIS—BRESSEY.—On August 2nd, at St. John's, Stockcross, D. E. M. Douglas-Morris, Captain, R.A.M.C., to Violet Muriel, youngest daughter of Mr. and Mrs. E. Bressey, of Stockcross, Newbury.

MANSFIELD—CATHELS.—On August 5th, Harold Young Mansfield, M.D., Captain, R.A.M.C., to Katharine Stuart, eldest daughter of the Rev. and late Mrs. Cathels, Hawick, Scotland.

PRITCHETT—SALTER.—On July 31st, at St. Mary's, Harrow-on-the-Hill, Lieutenant Henry Norman Pritchett, R.A.M.C., to Ethel Alice, youngest daughter of the late Mr. Alfred Salter and Mrs. Salter, of Harrow-on-the-Hill.

DEATHS.

EAST.—On July 31st, killed in action, Captain Gordon Doulton East, M.B., R.A.M.C., attached Grenadier Guards, aged 28.

MACRURY.—On August 4th, at De Vere-gardens, Kensington, Lieutenant-Colonel Colin W. MacRury (late I.M.S.), aged 74 years.

NEWINGTON.—On July 31st, at Ticehurst, suddenly, Herbert F. Hayes Newington, F.R.C.P. Edin., M.R.C.S. Eng., aged 70.

PINNIGER.—On August 4th, at Widcombe Villa, Richmond-hill, Clifton, Bristol, Wilfrid James Hussey Pinniger, M.D., B.S., M.R.C.S., L.R.C.P., aged 34.

UBSDELL.—On July 31st, at Hillcrest, Buckfastleigh, Henry Ubsdell, M.R.C.S., L.S.A., aged 78.

URQUHART.—On July 31st, at Tannachie, Meads, Eastbourne, Alexander Reid Urquhart, M.D., F.R.C.P.E., LL.D., of Milnfield, Elgin, aged 65.

N.B.—A fee of 5s. is charged for the insertion of Notices of Births, Marriages, and Deaths.

BOOKS, ETC., RECEIVED.

BELL, G., AND SONS, London.
Modern Man and His Forerunners: A Short Study of the Human Species, Living and Extinct. By H. G. F. Spurrell, M.A., M.B., B.Ch. Oxon., F.Z.S. 7s. 6d. net.
Killing for Sport: Essays by Various Writers, with a Preface by Bernard Shaw. Edited by H. S. Salt. 1s. net.

BUTTERWORTH AND CO., London and Calcutta.
Kala-Azar: Its Treatment. By U. N. Brahmachari, M.A., M.D., Ph.D., Rai Bahadur. With Foreword by the Honourable Surgeon-General W. R. Edwards, C.M.G., I.M.S. 8s. 6d. net.

HARVARD UNIVERSITY PRESS. (HUMPHREY MILFORD, London.)
State Sanitation: A Review of the Work of the Massachusetts State Board of Health. By G. Chandler Whipple. Vol. I. 10s. 6d. net.

HEINEMANN, WILLIAM, London.
Electro-therapy in Gynæcology. By Samuel Sloan, M.D., F.R.F.P.S.G. 12s. 6d. net.

LIVINGSTONE, E. AND S., Edinburgh.
Catechism Series. 1s. 3d. each. Materia Medica, Part 3, second edition; Pathology, Parts 2 and 3, second edition; Surgery, Parts 3 and 4, third edition.

LONGMANS, GREEN, AND CO., London.
What Germany is Fighting For. By Sir Charles Waldstein. 1s. 6d. net.

MENTAL CULTURE ENTERPRISE, 329, High Holborn.
Spiritualism and Sir Oliver Lodge. By Charles A. Mercier, M.D., F.R.C.P., F.R.C.S.

THIN, JAMES, Edinburgh.
Practical Chemistry for Medical Students. By A. C. Cumming, D.Sc. With Preface by James Walker. Second edition.

YEAR BOOK PUBLISHERS, 638, S. Dearborn-street, Chicago.
Practical Medicine Series. Under Editorship of Dr. C. L. Mix. Vol. II. General Surgery. By Dr. A. J. Orchaner. $2.0.

Notes, Short Comments, and Answers to Correspondents.

STUDENTS' NUMBER OF THE LANCET.

INFORMATION intended for the Students' Number of THE LANCET must be sent WITHOUT DELAY, addressed to the Sub-Editor, and marked on the envelope "Students' Number Only."

THE CARNEGIE TRUST AND CHILD WELFARE.

THE Carnegie United Kingdom Trustees having considered the reports prepared for them on the Physical Welfare of Mothers and Children have now issued a statement regarding the action they intend to take. In order to stimulate public effort, local and general, and to provide examples of what might be effected by wise organisation, they propose: 1. To designate certain urban areas in which they are prepared to meet the cost of erection and equipment of model welfare centres, to be controlled and maintained under an approved scheme by the local authority with the aid of Imperial grants. 2. To consider the cost of the acquisition or erection of a suitable building in London for the housing of a central bureau or institute of a national character, to serve as a coördinating agency for all the various local and other organisations connected with infant and maternal welfare in England and Wales, and of a similar central institution for Scotland. The purpose of the proposed central institutes would be to assist the various voluntary and statutory bodies engaged in the subject in England and Scotland respectively; it would not supersede them or encroach upon their proper spheres of local interest. 3. To consider in a few suitable cases applications from local authorities for assistance towards the initial capital outlay on the preparation and equipment of open spaces for children's playgrounds, which the authorities have acquired for the purpose and are prepared to maintain.

The trustees hope in these ways, during the next three or four years, to employ the limited fund at their disposal in promoting a few well-devised experiments in organised effort towards the solution of a grave national problem.

RESEARCH AND INDUSTRY.

Professor W. H. Perkin's address on Tuesday at the Oxford Summer Meeting of University Extension dealt with the question of the loss of certain industries which at one time appeared to be firmly established in this country, but which left it to flourish abroad. The causes of our failure have been our neglect of scientific methods and lack of appreciation of the value of research. At the beginning of the war Germany had about ten times as many advanced students engaged in research work as we had. But, said Professor Perkin, the scientific workers in our Universities have now demonstrated to manufacturers their ability to tackle and solve difficult manufacturing problems, whether in connexion with munitions of war or in the development of purely industrial operations, and it is gratifying to see that their efforts are beginning to be appreciated in many quarters. A much closer association between the manufacturer and the scientific worker is now growing up which should help to re-establish the commercial superiority of this country.

TOWARDS A PURER MILK-SUPPLY.

A PETITION to the Prime Minister advocating the formation of a Milk Board endowed with full statutory powers to regulate trade in milk throughout the country is being promoted, and copies for signature can be obtained from the honorary secretary, Mr. John Struthers, 7, Portsdown-road, W. 9. The aim of the petitioners is to ensure a full supply of milk at a fair price, with adequate efficiency in its production and distribution to consumers. With regard to the functions of a Milk Board, a leaflet which is being distributed at the National Welfare and Economy Exhibition states that "generally, it would have everything to do with milk except trade in it. ..... It would, in fact, take a human interest in milk apart from profit, and on behalf of the community conduct a proficient and ever-expanding business."

THE HUMAN LOAD.

THE Post Office, when introducing women as mail-carriers, had the good sense to recognise the inferiority of woman to man as a weight-bearer, and 20 lbs. has been in practice the load of a postwoman, whereas 35 lbs. was the maximum limit of the postman. The Food Production Department has now taken useful action in recognising the same principle in regard to farm labour. A recent official notice points out the desirability of diminishing the standard sack from four to two bushels. Some evidence has been produced of injury to farmers' boys, and it is to be hoped that after reasonable time has been allowed for him to obtain the necessary supply of sacks the employer should be held responsible for any harm done to a woman or boy worker by carrying a sack of more than two bushels weight.

"THE IVORY CROSS."

SUPPORT is asked for the organisation known as the Ivory Cross, an extension of the original movement for supplying sailors and soldiers with dental assistance. Founded by Miss Ada Elizabeth Fletcher and inaugurated at the Mansion House in June last, it supplies the dental needs of the necessitous poor as well as of members of the Forces, active and reserve. The movement has the support, amongst others, of Sir Arthur Newsholme and Sir StClair Thomson. A donation of 1s. supplies a single tooth and 8s. a complete set. Donations should be sent to Sir Herbert Bartlett, the honorary treasurer, 10, Conduit-street, W., or to the bankers, Messrs. Barclays, 1, Pall Mall East, S.W.

METEOROLOGICAL READINGS.

(Taken daily at 8.30 a.m. by Steward's Instruments.)

THE LANCET Office, August 8th, 1917.

Date.	Rainfall.	Solar Radio in Vacuo.	Maximum Temp. Shade.	Min. Temp.	Wet Bulb.	Dry Bulb.	Remarks.
Aug. 2	...	79	59	55	57	59	Cloudy
,, 3	0·10	87	63	59	58	60	Raining
,, 4	0·33	89	63	59	60	61	Overcast
,, 5	0·30	75	63	58	60	63	Overcast
,, 6	...	110	73	61	60	62	Overcast
,, 7	...	117	79	62	63	65	Fine
,, 8	...	91	69	60	61	63	Overcast

Other information which we have been accustomed to give in these "Readings" is withheld for the period of the war.

The following journals, magazines, &c. have been received:—Revista Clinica, Parasitology, Journal of Hygiene, Southwestern Medicine, British Journal of Dental Science, Archives de Médecine et de Pharmacie Militaires, Medical Review, Cleveland Medical Journal, British Dental Journal, Archives of Internal Medicine, Practitioner.

Medical Diary for the ensuing Week.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

POST-GRADUATE COLLEGE, West London Hospital, Hammersmith-road, W.

MONDAY.—2 P.M., Medical and Surgical Clinics. X Rays. Mr. Gray: Operations. Mr. B. Harman: Diseases of the Eye. Dr. Simson: Diseases of Women.

TUESDAY.—2 P.M., Medical and Surgical Clinics. X Rays. Mr. Baldwin: Operations. Dr. Banks Davis: Diseases of the Throat, Nose, and Ear. Dr. Pernet: Diseases of the Skin.

WEDNESDAY.—10 A.M., Dr. Saunders: Diseases of Children. Dr. Banks Davis: Operations of the Throat, Nose, and Ear. 2 P.M., Medical and Surgical Clinics. X Rays. Mr. Pardoe: Operations.

THURSDAY.—2 P.M., Medical and Surgical Clinics. X Rays. Mr. Gray: Operations. Mr. B. Harman: Diseases of the Eye.

FRIDAY.—10 A.M., Dr. Simson: Gynæcological Operations. 2 P.M., Medical and Surgical Clinics. X Rays. Mr. Baldwin: Operations. Dr. Banks Davis: Diseases of the Throat, Nose, and Ear. Dr. Pernet: Diseases of the Skin.

SATURDAY.—10 A.M., Dr. Saunders: Diseases of Children. Dr. Banks Davis: Operations of the Throat, Nose, and Ear. Mr. B. Harman: Eye Operations. 2 P.M., Medical and Surgical Clinics. X Rays. Mr. Pardoe: Operations.

EDITORIAL NOTICES.

IT is most important that communications relating to the Editorial business of THE LANCET should be addressed *exclusively* "TO THE EDITOR," and not in any case to any gentleman who may be supposed to be connected with the Editorial staff. It is urgently necessary that attention should be given to this notice.

It is especially requested that early intelligence of local events having a medical interest, or which it is desirable to bring under the notice of the profession, may be sent direct to this office.

Lectures, original articles, and reports should be written on one side of the paper only, *and when accompanied by blocks it is requested that the name of the author, and if possible of the article, should be written on the blocks to facilitate identification.*

Letters, whether intended for insertion or for private information, must be authenticated by the names and addresses of their writers—not necessarily for publication.

We cannot prescribe or recommend practitioners.

Local papers containing reports or news paragraphs should be marked and addressed "To the Sub-Editor."

Offices: 423, STRAND, LONDON W.C. 2.

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